

PRINTER:
EPSON®
MODEL RX-80



TECHNICAL SERVICE DATA FOR YOUR PRINTER

PRELIMINARY SERVICE CHECKS

This data provides the user with a time-saving service tool which is designed for quick isolation and repair of printer malfunctions.

Check all interconnecting cables for good connection and correct hook-up before making service checks.

Replacement or repair of the AC Switch Board, Control Board, Function Switch Panel Board, or connectors may be necessary after the malfunction has been isolated.

TEST EQUIPMENT AND TOOLS

TEST EQUIPMENT	TOOLS
Digital Volt/Ohm Meter	Phillips Screwdriver
Logic Probe	Small Screwdriver
Transistor Tester	Needlenose Pliers
	9/32" End Wrench
	Solvent for Timing Belt

PARTS LIST AND DESCRIPTION

ITEM NO.	PART NO.	DESCRIPTION
F1	X502040020	Fuse (1A @ 250V S10-B10)
H1	F401500000	Print Head
M1	F316014000	Timing Belt Motor Assembly
M2	F316016000	Paper Feed Motor Assembly
C1	X202596820	Electrolytic Capacitor 6800 μ F @ 50VDC
C2	X202396820	Electrolytic Capacitor 6800 μ F @ 25VDC
C3	X202592220	Electrolytic Capacitor 2200 μ F @ 50VDC
C4	X200143310	Electrolytic Capacitor 330 μ F @ 10VDC
Q23,Q24,Q25	X300101502	Transistor 25A1015Y
Q26	X302251600	Regulator Transistor 2SC2516
Q28	X301077251	Regulator Transistor 2SB772
10C	X440193050	Regulator IC μ PC305C
SR1	X440078051	Regulator IC 78L05A
DB1	X340400060	Bridge Rectifier 3B4B41
DB2	X340400030	Bridge Rectifier 1B4B1
ZD4	X330000059	Zener Diode 4.8V H25B-2
L1	Y435201003	Choke Coil (200 μ H)
L2	Y435201002	Choke Coil
T1	Y435501300	Power Transformer

PRELIMINARY SERVICE CHECKS (Continued)

GENERAL OPERATING INSTRUCTIONS

PRINTER STATUS (SW1) AND LINE FEED STATUS (SW2)

SW1	On	Off
1	Compressed	Not Compressed
2	Graphics Character Set	Control Codes
3	Beeper Off	Beeper On
4	12-inch Form	11-inch Form
5	Paper Out Sensor Off	Paper Out Sensor On
6	USA	(International Character Set)
7	USA	(International Character Set)
8	USA	(International Character Set)
SW2	On	Off
1	Slashed Zero	Regular Zero
2	Printer Select On	Printer Select Off
3	Auto Line Feed with Carriage Return	Line Feed from Host
4	One inch Skip Over Perf	Normal (No Perf)

PRINTER SELF-TEST

To use the built-in self-test function, put paper in the printer and hold down the LF (Line Feed) button while turning On the printer.

ON LINE, FF AND LF BUTTONS

Printer is On Line (Ready to receive data from the computer) when all three given LED's are On.

The printer is Off Line when only the top green LED is On.

Pressing the On Line button once puts the printer Off Line and pressing it again puts the printer back On Line.

The printer must be Off Line for the FF (Form Feed) and LF (Line Feed) buttons to function.

MISCELLANEOUS ADJUSTMENTS

PTS (HEAD POSITION) SENSOR ADJUSTMENT

Connect Channel A of a dual trace scope to pin 10 of IC 9D and set the horizontal sweep time to .5mSec. Set the scope to trigger on the positive edge of the waveform. Hold down the LF button while turning the Printer On to activate the self printing test mode. Loosen the screw holding the PTS (Position Timing Signal) Sensor Board on the right side of the Timing Belt Motor (M2). Use a screwdriver in the slot provided to adjust the PTS Sensor Board for a pulse width of approximately 1.67mSec while the Printer is in the self printing test mode. See Figure 1.

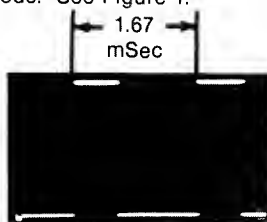


Figure 1

HOME POSITION SENSOR ADJUSTMENT

Loosen the screw holding the Home Position Sensor Board. Use a small flat screwdriver in the notch provided to adjust the Home Position Sensor Board. Move the notch to the left to move the margin left or move the notch to the right to move the margin right. Install the Ribbon Cartridge and perform the self printing test to test the margin position. Repeat this test until printing begins at the desired position on the paper. When the desired position is obtained, tighten the Home Position Sensor Board mounting screw.

TIMING BELT ADJUSTMENT

Loosen the adjustment screw on the belt tension plate. Tighten the belt until no more than 1/4 inch movement occurs on the Printhead when it is at either end of the carriage shaft and the belt is pressed inward. Tighten the adjustment screw on the belt tension plate. Run the Printer in self-test mode and note the distance between characters. The distance should be the same.

PRELIMINARY SERVICE CHECKS (Continued)

DISASSEMBLY INSTRUCTIONS

CABINET UPPER CASE REMOVAL

Remove paper feed knob. Remove printer lid. Remove two screws holding upper case. Disconnect control panel connector and remove upper case.

POWER SUPPLY BOARD REMOVAL

Disconnect power transformer from Power Supply board and remove one screw holding board and one screw holding ground lead of power cord and remove the Power Supply board.

MAIN BOARD REMOVAL

Disconnect ground Connector FG, Connector CN2, and the Printer Mechanism ribbon cable. Remove three screws holding Main board to cabinet bottom. Remove two screws holding heat sink to cabinet bottom. Push back two plastic retaining tabs and remove Main board from cabinet.

PRINTER MECHANISM REMOVAL

Disconnect printer mechanism ribbon cable from main board. Remove two screws holding the mechanism to lower case assembly. Remove one screw on right hand side of paper feed motor holding ground strip. Slide mechanism forward and remove from unit.

PRINthead REMOVAL

Slide Printhead to left of carriage to allow access to Printhead Cable. Disconnect Printhead Cable by pulling the plastic tab attached to bottom of Printhead Cable. Slide Printhead to center position for access to Head Lock Lever. Rotate lever left to release Printhead. Lift Printhead straight up to remove from Carriage assembly.

HOME POSITION SENSOR REMOVAL

Unsolder three Home Position Sensor wires from Printhead Connector board. Remove one screw holding Home Position Sensor to chassis. Remove Home Position Sensor.

POSITION TIME SENSOR (PTS) REMOVAL

Unsolder four wires from the PTS Sensor board. Remove one screw holding PTS Sensor to Carriage Motor assembly. Remove PTS Sensor from Carriage Motor.

TIMING BELT MOTOR REMOVAL

Remove the Printhead. Refer to Printhead removal. Remove wire tie from Timing Belt Motor wires. Remove four screws holding Timing Belt Motor to chassis. Unsolder the six Timing Belt Motor wires from terminal board located under Carriage assembly. Timing Belt Motor may now be removed.

PAPER FEED MOTOR REMOVAL

Unsolder the six Paper Feed Motor wires from terminal board located under Carriage assembly. Remove two screws holding Paper Feed Motor to Carriage assembly and remove motor.

PAPER END ASSEMBLY REMOVAL

Unsolder two wires from Paper End assembly. Unhook Paper End lever spring from outer paper guide. Bend back metal tabs holding Paper End circuit board and remove.

TIMING BELT REMOVAL

Remove Printer mechanism from case. See Disassembly Instructions. Press downward on the Timing Belt at each side of the point where belt is attached to Carriage Assembly. CAUTION: Belt may be held in place with adhesive cement. If removal is difficult, slide the Carriage Assembly to the right and over the access hole in the chassis base. Turn the chassis over. Carefully cut the adhesive seal with a razor blade and remove the belt from the Carriage Assembly with needle-nose pliers.

Loosen the screw securing the Belt Tension Plate and remove the Timing Belt from the belt-driven pulley. Remove Timing Belt Motor from the Printer base for access to the belt drive pulley. Remove belt from pulley. Push belt through opening in right frame and remove belt from Printer.

Install replacement by reversing the removal procedure. Before adjusting tension, apply a drop of adhesive cement where Timing Belt is attached to Carriage Assembly and allow to dry. See Timing Belt Adjustment in Miscellaneous Adjustments.

PRELIMINARY SERVICE CHECKS (Continued)

SERVICE CHECKS

SEE INTERCONNECTING DIAGRAM AND PHOTOS TO MATCH THE NUMBER IN THE CIRCLES WITH THOSE IN THE FOLLOWING DATA FOR SERVICE CHECKS TO BE PERFORMED.

1 PRINTER DEAD

- (a) Check Fuse F1. If the fuse is open, unplug Connectors CN1 and CN2 and check Power Transformer T1 for shorted windings.
 - (b) If Power Transformer T1 is good, check Capacitors C1, C2, C3 and C4 in the power supply for shorts. Also check Bridge Rectifiers DB1 and DB2 for shorts.
 - (c) If Fuse F1 is good, check for 120 VAC between pins 3 and 6 of Connector CN1 on the AC Switch board. If 120 VAC is missing, check Power Switch SW1 and Line Choke L1 on the AC Switch board. Also check for an open power cord.
 - (d) If 120 VAC is present at pins 3 and 6 of Connector CN1, check the voltages on three secondary windings of Power Transformer T1 at Connector CN2. If any of the secondary voltages are missing, check the power transformer for an open winding.
 - (e) If the secondary voltages are normal at Connector CN2, check for approximately 35 VDC at the output of Bridge Rectifier DB1 and 13 VDC at the output of Bridge Rectifier DB2. If either voltage is missing, check for an open bridge rectifier. If the voltages are normal at the outputs of the bridge rectifiers, check for 23.5 VDC at the output of Transistor Q26. If 23.5 VDC is missing, check Transistors Q24 and Q25, IC 10C, Zener Diode ZD4, choke L1 and other components associated with the 23.5 VDC regulator circuit. Check for 5 VDC at the emitter of Transistor Q23. If the 5 VDC is missing, check Regulator Transistor Q28, Regulator IC SR1, Choke L2 and other components associated with the 5 VDC regulator circuit.
 - (f) If the power supply voltages are normal, replace the Control Board.
- (b) If the print head checks good, check Connector CN4. If Connector CN4 is good, replace the Control Board.

4 PRINT HEAD HAS MISSING DOTS

- (a) Remove power from the Printer. Unplug Connector CN4 and check the resistance of the print head solenoids. If any of the solenoids are open, replace the print head assembly. If the print head solenoids check good, check the print head wires for possible defects. If the print head is good, replace the Control Board.

5 PAPER FEED MOTOR MALFUNCTIONING

- (a) If the Printer will not advance the paper, check for 24 VDC at pin 2 of Connector CN4. If the 24 VDC is missing, check the 24 VDC regulated power supply. If the power supply checks good, it may be necessary to replace the Control Board. If 24 VDC is present at pin 2 of Connector CN4, check pins 2, 6, 8, 10 and 12 of CN4 for good connections. If Connector CN4 is good, check the Paper Feed Motor windings. If any of the windings are open, replace the Paper Feed Motor (M1).
- (b) If Connector CN4 and the Paper Feed Motor (M2) check good, check the Control Board and the Function Switch Panel Board by substitution.

6 TIMING BELT MOTOR MALFUNCTIONING

- (a) If the Timing Belt Motor (M2) does not move the print head, check for 24 VDC at pin 1 of Connector CN4. If the 24 VDC is missing, check the 24 VDC regulated power supply. If the power supply is good, it may be necessary to replace the Control Board. If 24 VDC is present at pin 1 of Connector CN4, check pins 1, 5, 7, 9 and 11 of CN4 for good connections. If Connector CN4 is good, check the windings of the Timing Belt Motor. If any of the windings are open, replace the Timing Belt Motor.

- (b) If Connector CN4 and the Timing Belt Motor are good, check the Control Board by substitution.

2 PRINTER WILL NOT RECEIVE DATA

- (a) Check Connector CN1 from the host Computer for a bad connection. If Connector CN1 is good, replace the Control Board.

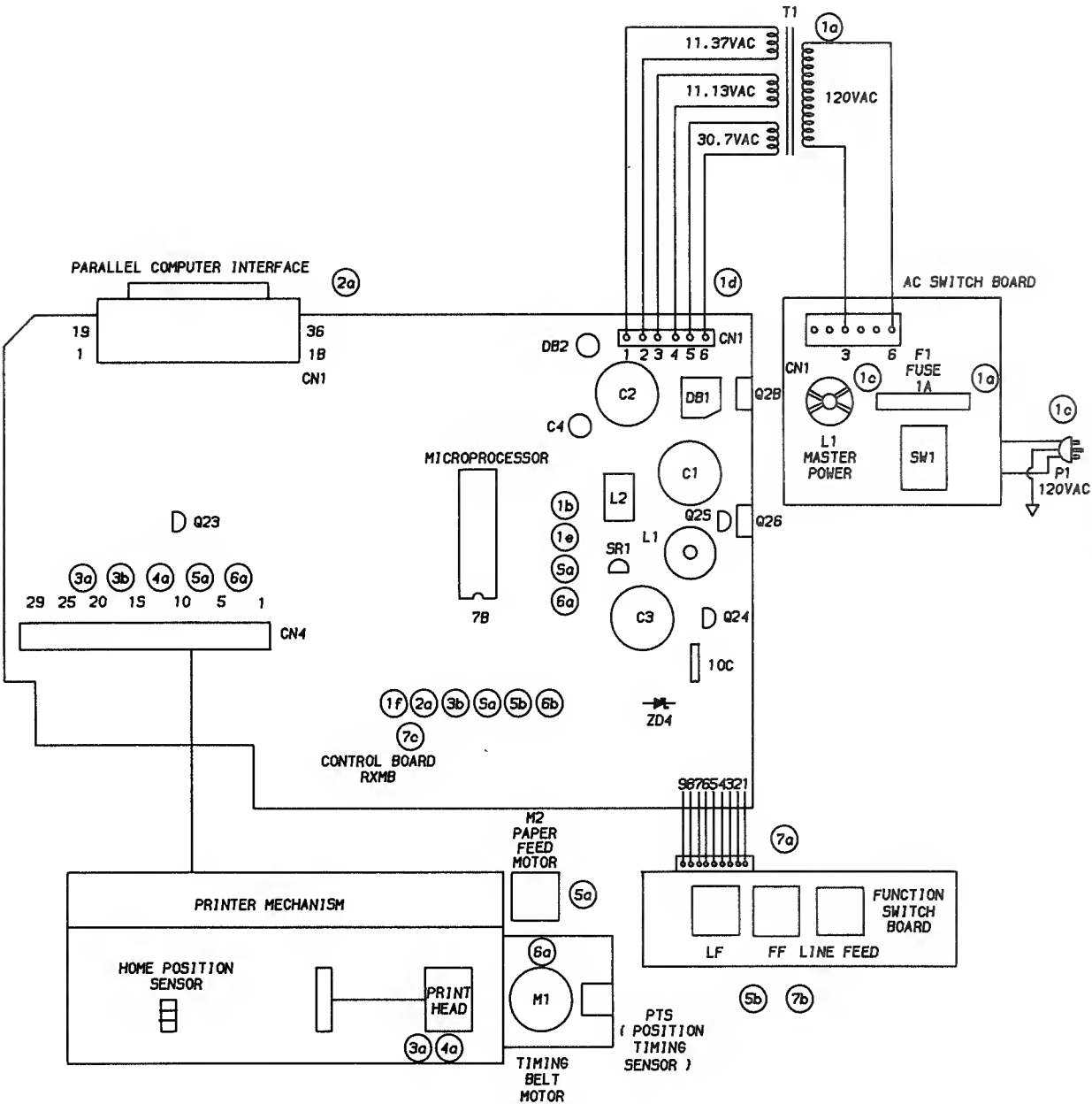
3 PRINT HEAD WILL NOT PRINT

- (a) Check for 24 VDC at pin 24 of Connector CN4. If the 24 VDC is missing, check the 24 VDC regulated power supply. If 24 VDC is present at pin 24 of CN4, unplug Connector CN4 and check the resistance between pin 24 and pins 19 thru 22 and 25 thru 29 of Connector CN4. Each solenoid should measure approximately 22 ohms. If the solenoid circuit is open, replace the print head assembly.

7 FUNCTION BOARD BUTTONS HAVE NO EFFECT

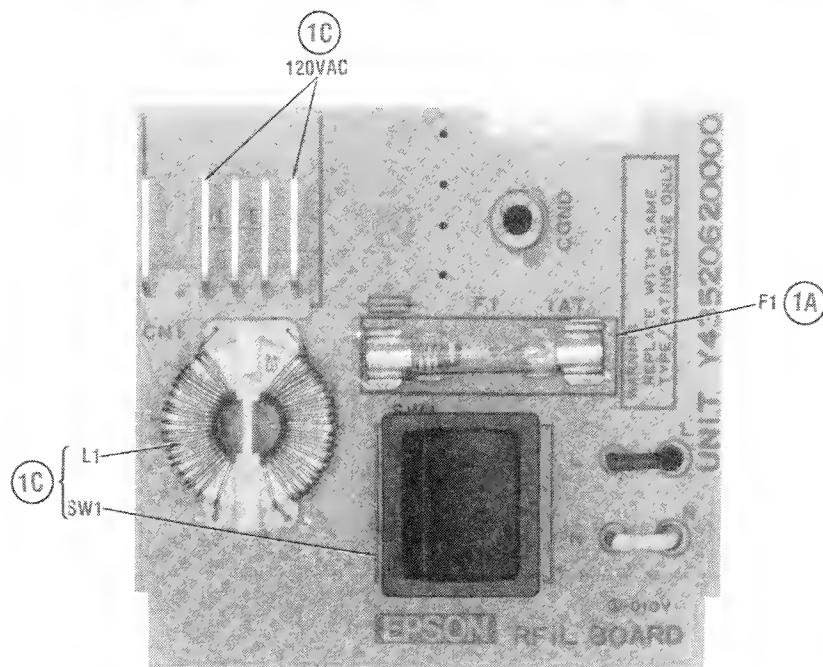
- (a) Check the Function Switch Board Connector for good connections.
- (b) Check the Function Switch Board by substitution.
- (c) If the Function Switch Board and its Connector are good, check the Control Board by substitution.

PRELIMINARY SERVICE CHECKS (Continued)

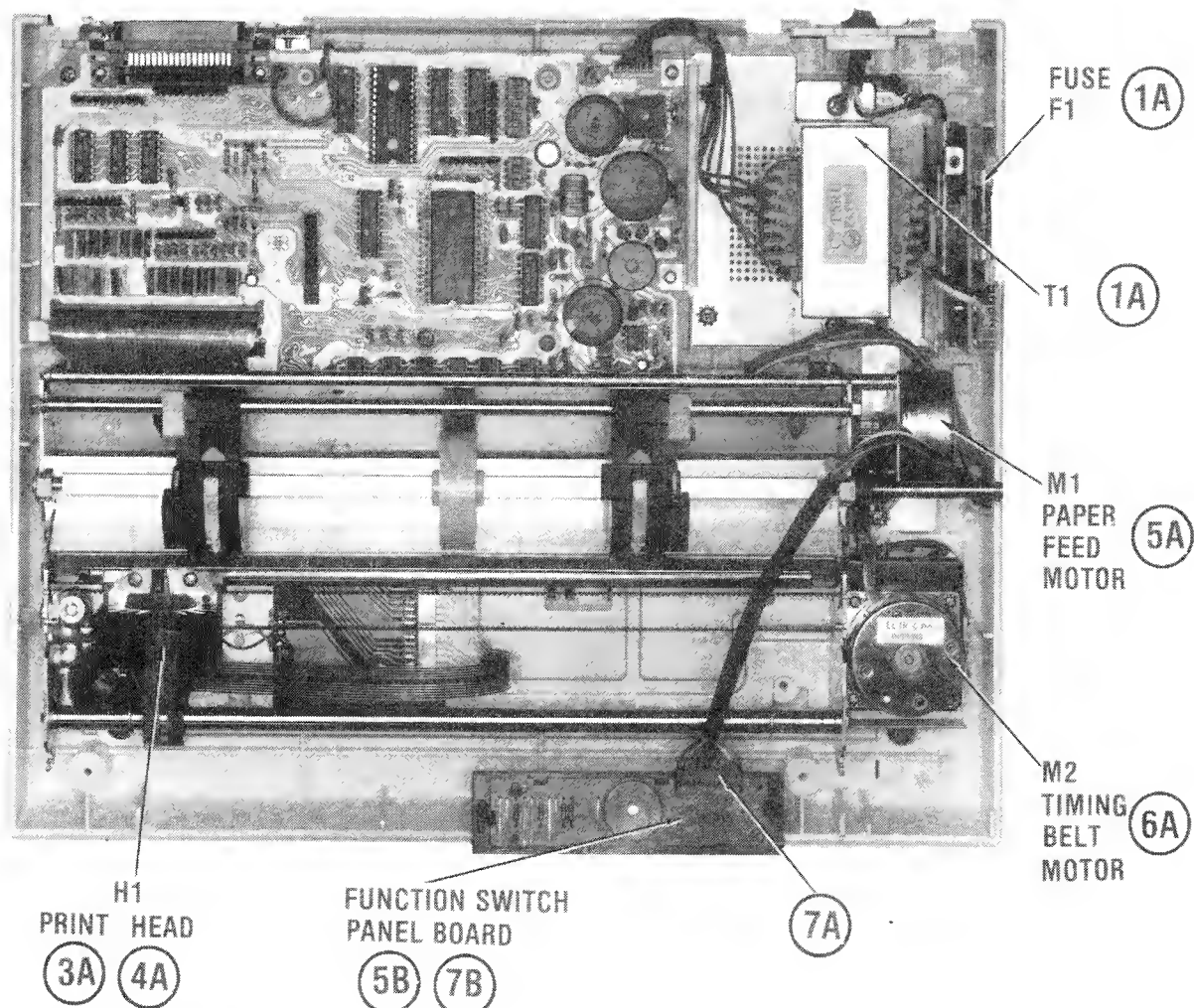


EPSON
MODEL RX-80

PRELIMINARY SERVICE CHECKS (Continued)

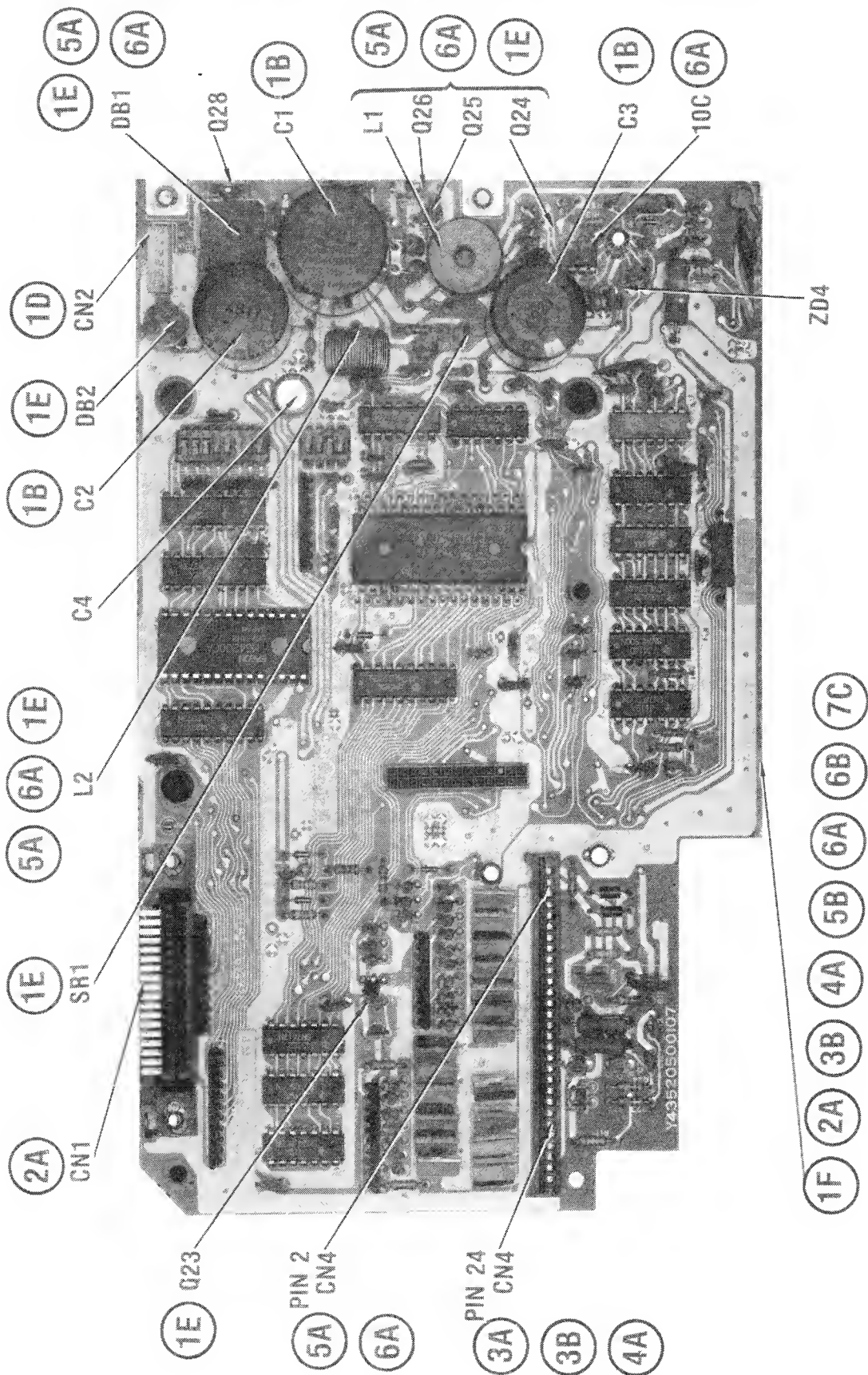


POWER SUPPLY



CHASSIS-TOP VIEW

PRELIMINARY SERVICE CHECKS (Continued)



MAIN BOARD

EPSON
MODEL RX-80

PRELIMINARY SERVICE CHECKS (Continued)

PREVENTATIVE MAINTENANCE

ENVIRONMENT

Computers perform best in a clean, cool area that is below 80 degrees Fahrenheit and free of dust and smoke particles. Even though home Computers are not affected by cigarette smoke as much as commercial Computers are affected, it is better to maintain a smoke-free area around the Computer. Do not block cabinet vents of any of the Computer system; Computer, Monitor, Printer, or other power devices.

ELECTRICAL POWER

Variations in the line voltage can affect the Computer. Try to avoid these fluctuations by using an AC receptacle that is on a power line not used by appliances or other heavy current demand devices. A power-surge protector, power-line conditioner, or non-interruptible power supply may be needed to cure the problem. **Do not** switch power On and Off frequently.

KEYBOARD

Liquids spilled into the Keyboard can ruin it. Immediately after a spill occurs, disconnect the Computer power plug from AC power outlet. Then, if circuitry or contacts are contaminated, disassemble the Keyboard and carefully rinse the Keyboard printed circuit board with distilled water and let it dry. Use a cotton swab to clean between the keys. Use a non-abrasive contact cleaner and lint-free wipers on accessible connectors and contacts.

DISK DRIVES

Clean the read/write heads of the Disk Drives about once a month or after 100 hours usage. Use only an approved head cleaning kit.

Handle carefully to preserve proper disk head alignment. A sudden bump or jolt to the Disk Drives can knock the disk head out of alignment. If the disk drive must be transported, place an old disk in slot and close door during transport.

Store disks in their protective covers and never touch the disk surface. Observe the disk handling precautions usually found on the back of disk protective covers.

PRINTERS

Carefully vacuum the Printer regularly. Wipe surface areas clean using a light all-purpose cleaner. Do not oil the machine. The oil will collect abrasive grit and dust. The dust will act as a blanket. This can cause components to overheat and fail.

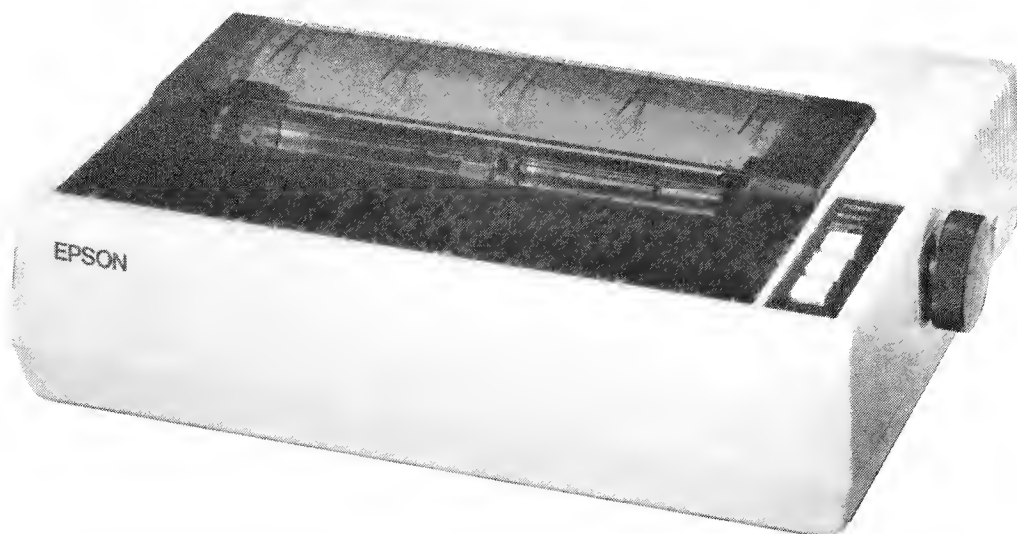
STATIC ELECTRICITY

Static electricity discharge can affect the Computer. In order to minimize the possibility, use anti-static mats, sprays, tools and materials, and maintain good humidity in the Computer environment.

MONITOR

Use an isolation transformer with any Monitor that does not come as part of the system since some Monitors use a HOT chassis (chassis connected to one side of the AC line). The face of the Monitor should never be left on for long periods of time at high brightness level except when pattern is being changed periodically. Use caution when cleaning anti-glare screens, to preserve the glare-reduction feature.

EPSON
MODEL RX-80
CP9



CP9
EPSON
MODEL RX-80

PRELIMINARY SERVICE CHECKS

ENCLOSED

INDEX

	Page		Page
Block Diagram	9	Photos	
Disassembly Instructions	32	Control Board	19
Exploded View Printer Mechanism	11,12,21,22	Main Board	24,26,27
Exploded View Tractor Feed	10,23	Power Supply Board	20
General Operating Instructions	6	Safety Precautions	5
GridTrace Location Guide		Schematics	
Main Board	25	IC Pinouts, Terminal Guides	29
Line Definitions	5	Notes	31
Logic Chart	13,14	Power Supply	4
Mechanical Parts List	33	Printer	2,3,30
Miscellaneous Adjustments	28	Test Equipment	6
Parts List	15,16,17,18	Troubleshooting	7,8,9

SAMS™

Howard W. Sams & Co., Inc.

4300 West 62nd Street, P.O. Box 7092, Indianapolis, Indiana 46206 U.S.A.

The listing of any available replacement part herein does not constitute in any case a recommendation, warranty or guaranty by Howard W. Sams & Co., Inc., as to the quality and suitability of such replacement part. The numbers of these parts have been compiled from information furnished to Howard W. Sams & Co., Inc., by the manufacturers of the particular type of replacement part listed.

Reproduction or use, without express permission, of editorial or pictorial content, in any manner, is prohibited. No patent liability is assumed with respect to the use of the information contained herein.

© 1985 Howard W. Sams & Co., Inc.

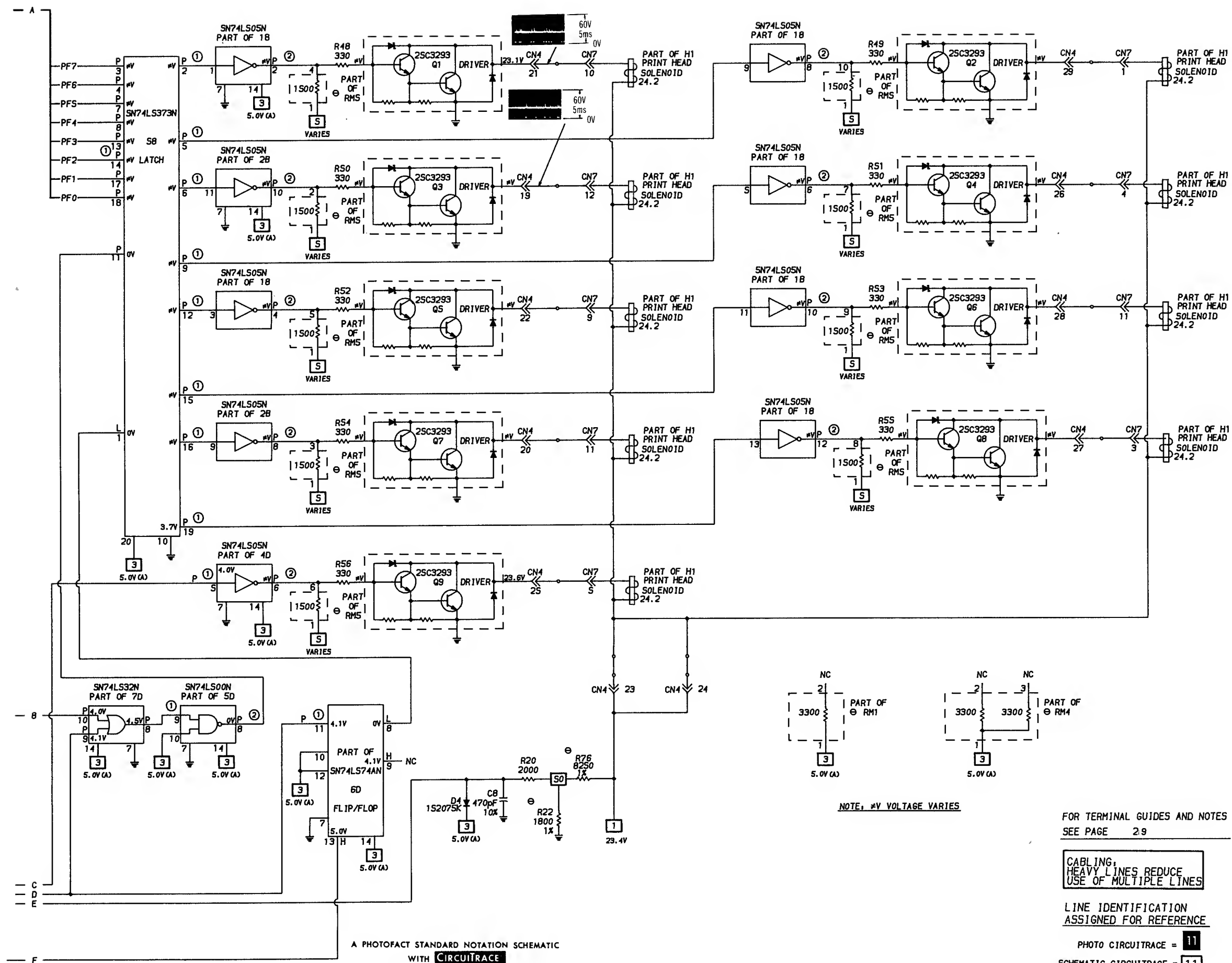
4300 West 62nd Street, P.O. Box 7092, Indianapolis, Indiana 46206 U.S.A.

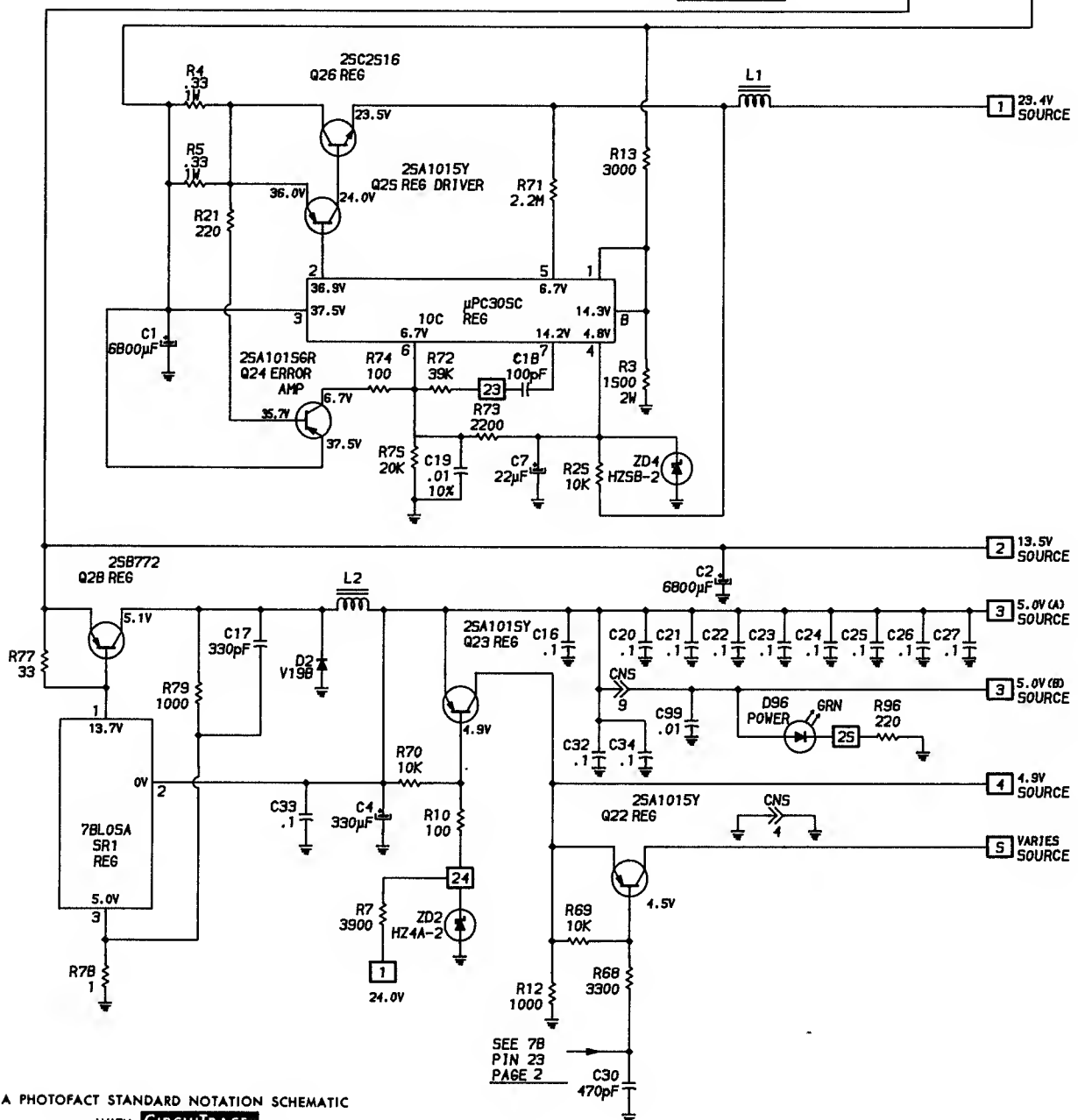
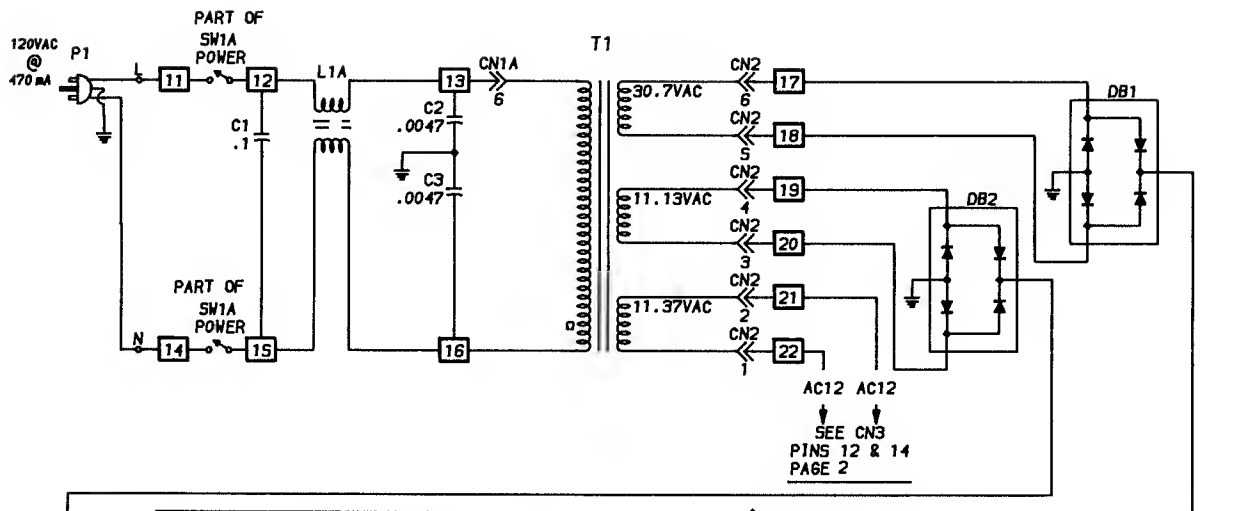
Printed in U.S. of America.

85CP-14953

DATE 6-85







A PHOTOFACT STANDARD NOTATION SCHEMATIC
WITH **CIRCUITRACE**

© Howard W. Sams & Co., Inc. 1985

SAFETY PRECAUTIONS

1. Use an isolation transformer for servicing.
2. Maintain AC line voltage at rated input.
3. Remove AC power from the Printer before servicing or installing electrostatically sensitive devices. Examples of typical ES devices are integrated circuits and semiconductor "chip" components.
4. Use extreme caution when handling the printed circuit boards. Some semiconductor devices can be damaged easily by static electricity. Drain off any electrostatic charge on your body by touching a known earth ground. Wear a commercially available discharging wrist strap device. This should be removed prior to applying power to the unit under test.
5. Use a grounded-tip, low voltage soldering iron.
6. Use an isolation (times 10) probe on scope.
7. Do not remove or install boards, mechanical or electrical parts, or other peripherals with Printer AC power On.
8. Do not use freon-propelled sprays. These can generate electrical charges sufficient to damage semiconductor devices.
9. This Printer is equipped with a grounded three-pronged AC plug. This plug must fit into a grounded AC power outlet. Do not defeat the AC plug safety feature.
10. Periodically examine the AC power cord for damaged or cracked insulation.
11. The Printer cabinet is equipped with vents to prevent heat build-up. Never block, cover, or obstruct these vents.
12. Instructions should be given, especially to children, that objects should not be dropped or pushed into the vents of the cabinet. This could cause shock or equipment damage.
13. Never expose the Printer to water. If exposed to water turn the unit off. Do not place the Printer near possible water sources.
14. Never leave the Printer unattended or plugged into the AC outlet for long periods of time. Remove AC plug from AC outlet during lightning storms.
15. Do not allow anything to rest on AC power cord.
16. Unplug AC power cord from outlet before cleaning Printer.
17. Never use liquids or aerosols directly on the Printer. Spray on cloth and then apply to the Printer cabinet. Make sure the Printer is disconnected from the AC power line.

CP9
EPSON
MODEL RX-80

LINE DEFINITIONS

ACK	Acknowledge
AUTO FEED XT	Automatic Line Feed
BUSY	Ready
D0 thru D8	Data
ERR	Error
INIT	Initial
LD1 thru LD8	Latched Data
P/S	Parallel Select/Serial Select
PE	Paper End
PF0 thru PF7	Dot Control
RS	Reset
SLCT	Select
SLCTIN	Select In
STROBE	Strobe
+ 5V	5.0 Volts

GENERAL OPERATING INSTRUCTIONS

PRINTER STATUS (SW1) AND LINE FEED STATUS (SW2)

SW1	On	Off
1	Compressed	Not Compressed
2	Graphics Character Set	Control Codes
3	Beeper Off	Beeper On
4	12-inch Form	11-inch Form
5	Paper Out Sensor Off	Paper Out Sensor On
6	USA	(International Character Set)
7	USA	(International Character Set)
8	USA	(International Character Set)
SW2	On	Off
1	Slashed Zero	Regular Zero
2	Printer Select On	Printer Select Off
3	Auto Line Feed with Carriage Return	Line Feed from Host
4	One inch Skip Over Perf	Normal (No Perf)

PRINTER SELF-TEST

To use the built-in self-test function, put paper in the printer and hold down the LF (Line Feed) button while turning On the printer.

ON LINE, FF AND LF BUTTONS

Printer is On Line (Ready to receive data from the computer) when all three given LED's are On.

The printer is Off Line when only the top green LED is On.

Pressing the On Line button once puts the printer Off Line and pressing it again puts the printer back On Line.

The printer must be Off Line for the FF (Form Feed) and LF (Line Feed) buttons to function.

TEST EQUIPMENT

Test Equipment listed by Manufacturer illustrates typical or equivalent equipment used by SAMS' Engineers to obtain measurements and is compatible with most types used by field service technicians.

Equipment Name	B & K Precision Equipment No.	Simpson Equipment No.		
OSCILLOSCOPE	1570A,1590A,1596	454		
LOGIC PROBE	DP51			
LOGIC PULSER	DP101			
DIGITAL VOM	2830	463,467,470,474		
ANALOG VOM	277	260-7		
ISOLATION TRANSFORMER	TR110,1604,1653,1655			
FREQUENCY COUNTER	1803,1805	710		
COLOR BAR GENERATOR	1211A,1248,1251,1260	431		
DISK DRIVE ANALYZER				
FUNCTION GENERATOR	3020	420A,420D		
HI-VOLTAGE PROBE	HV-44	248		

TROUBLESHOOTING

PRINTER IS DEAD

If the printer is dead, check for 23.5 V at the emitter of Regulator Transistor (Q26). Also, check for 5.0 V at the emitter of Regulator Transistor (Q23). If either of these voltages is missing or incorrect, refer to the "Power Supply" section of this Troubleshooting guide. If the power supply voltages are normal, refer to the "Microcomputer (CPU) Operation" section of this Troubleshooting guide.

POWER SUPPLY

Printer will not turn On. Check the AC Line Fuse (F1). If the Fuse is open, check Electrolytics C1, C2, C3 and C4 for possible shorts. Also check Bridge Rectifiers (DB1 and DB2) for possible shorted diodes. Check Power Transformer (T1) for shorted windings.

If Fuse F1 is good, check for 120V AC between pins 3 and 6 of Connector CN1A on the AC Switch board. If 120V AC is missing, check Power Switch (SW1A) and Line Choke (L1A) on the AC Switch board. Also check for an open power cord. If 120V AC is present, check the AC voltages on the three secondary windings of Power Transformer (T1) at Connector CN2. If any of the secondary voltages are missing, check Power Transformer for an open winding.

Check for approximately 36V at the output of Bridge Rectifier (DB1) and 13.5V at the output of Bridge Rectifier (DB2). If either voltage is missing, check the associated Bridge Rectifier for an open diode.

Check for 23.5V at the emitter of Regulator Transistor (Q26). If the 23.5V is missing, check Error Amp Transistor (Q24), Regulator Transistor (Q25), Regulator IC (10C), Zener Diode (ZD4), Choke (L1) and other components associated with the 23.4V regulator circuit.

Check for 5V at the emitter of Regulator Transistor (Q23). If the 5V is missing, check Regulator Transistor (Q28), Regulator IC (SR1), Choke (L2) and other components associated with the 5V regulator circuit.

MICROCOMPUTER (CPU) OPERATION

Check for 5.0V on pin 43 of Microcomputer IC (7B). If the 5.0V is missing, refer to the "Power Supply" section of this Troubleshooting guide.

Verify that the clock oscillator is functioning by checking for a 11MHz waveform on pin 30 of IC 7B. If the oscillator is not functioning, check Crystal CR1 and Capacitors C9 and C10. If these components check good, check IC 7B by substitution.

If the oscillator is good, check the operation of the reset circuit. Connect a logic probe to pin 28 of IC 7B. Turn On the Printer. Pin 28 should go Low for about 30mSec and then go High. If there is no reset signal on pin 28 of IC 7B, check for a momentary High at pin 11 of IC 9B when the Printer is turned On. If the momentary High is High at pin 11, check IC 9B by substitution. If a momentary High does not appear at pin 11 of IC 9B, check for a momentary Low at pin 1 of IC 9D. If the momentary Low appears at pin 1, check IC 9D by substitution. If the momentary Low does not appear at pin 1 of IC 9D, check Electrolytic C6, Resistors R36 and R39, and Diode D3.

If the reset signal remains Low at pin 28 of IC 7B, check for a constant High on pin 11 or pin 12 of IC 9B. If neither pin is High, check IC 9B by substitution. If pin 11 of IC 9B remains High, check IC 9B, Resistors R36 and R39, and Capacitor C6. If pin 12 of IC 9B remains high, check IC 9B, Resistors R9 and R37, Capacitor C15 and Resistor Network RM1.

Check for the ALE pulses at pin 46 of Microcomputer IC (7B). If the pulses are missing at pin 9, check the operation of the clock circuit. If the clock pulses are normal, check IC 7B by substitution. If the Clock pulses, Reset signal and ALE pulses are good, check the logic probe readings on the remaining pins of IC 7B. Compare these readings with the readings shown on the schematic.

PRINTER WILL NOT RECEIVE DATA

Printer will not receive data from the Computer. Set up the host Computer to send information to the Printer and check for the STROBE pulses at pin 1 of IC 9B. If the STROBE pulses are missing at pin 1 of IC 9B, check for pulses at pin 5 of IC 9D. If the pulses are present on pin 5 of IC 9D, check ICs 9B and 9D by substitution. If the STROBE pulses are missing at pin 5 of IC 9D, check Resistors R8 and R38 and the connection at pin 1 of Connector CN1.

If the STROBE pulses are good at pin 1 of IC 9B, check for pulses on the BUSY line (pin 11 of Connector CN1) and on the ACK line (pin 10 of Connector CN1). If the BUSY pulses are missing, check for pulses at pin 8 of Flip/Flop IC (9C). If there are no pulses at pin 8, check IC 9C by substitution. If the pulses are present at pin 8 of IC 9C, check for pulses at pin 10 of IC 9B. If there are no pulses at pin 10 of IC 9B, check IC 9B and the Microcomputer IC (7B) by substitution. If there are pulses present at pin 10 of IC 9B, check IC 4D by substitution. If the ACK pulses are missing, check for pulses at pin 5 of IC 3B. If pulses are present at pin 5, check IC 3B by substitution. If there are no pulses at pin 5 of IC 3B, check IC 7B by substitution.

If the STROBE, BUSY and ACK pulses are present, check IC 7B by substitution.

PRINT HEAD MALFUNCTIONING

The print head is moving back and forth but is not printing. With the printer turned On but not printing, check for 23.4V supplied to the print head solenoids. This voltage can be measured on one end of Resistor R6. If the 23.4V is missing, refer to the "Power Supply" section of this Troubleshooting guide. If the 23.4V is present, check for pulses at pin 23 of Microcomputer IC (7B) with the Printer in the self printing test mode. These pulses can be measured at the high end of Capacitor C30. If the pulses are missing, replace IC 7B.

If the pulses are present at pin 23 of IC 7B, check for 5V peak to peak pulses at the collector of Regulator Transistor (Q22). If the pulses are missing, check Transistor Q22. If the pulses are present at the collector of Q22, check for pulses at pins 2, 5, 6, 9, 12, 15, 16 and 19 of Latch IC (5B). If the pulses are missing at pins 2, 5, 6, 9, 12, 15, 16 and 19, check for pulses at pins 3, 4, 7, 8, 13, 14, 17 and 18 of IC 5B. If these pulses are missing, check IC 7B. If the pulses are present at pins 3, 4, 7, 8, 13, 14, 17 and 18 of IC 5B, check for the WR signal pulses at pin 9 of IC 7D. Make sure that the Printer is still in the self printing test mode. If the WR pulse

TROUBLESHOOTING (Continued)

is not present at pin 9 of IC 7D, check IC 7B. If the WR is present at pin 9 of IC 7D, check for a pulse on pin 8 of IC 7D.

If there is a pulse on pin 8 of IC 7D, check for a pulse on pin 11 of Latch IC (5B). If there is no pulse on pin 11 of IC 5B, replace IC 5D. If there is a pulse on pin 11 of IC 5B, check for a Low logic reading on pin 1 of IC 5B. If pin 1 of IC 5B is not Low, check Flip/Flop IC (6D).

If pin 1 of IC 5B is Low, check IC 5B. If there is no pulse on pin 8 of IC 7D, check for a pulse on pin 5 of IC 6D. If there is a pulse at pin 5 of IC 6D, check IC 7D. If there is no pulse at pin 5 of IC 6D, check for the ALE signal on pin 1 of IC 5D. If the ALE signal is missing on pin 1 of IC 5D, check IC 7B. If the ALE signal is present on pin 1 of IC 5D, replace IC 5D.

If one pin in the print head is not functioning, check for 23.4V at the collector of Driver Transistors (Q1 through Q9) for the defective pin. Make the voltage measurement with the Printer turned On but not printing. If the 23.4V is missing, check the solenoid coil for the defective pin. If 23.4V is present on the collector of the Transistor, check for a drive pulse on the base of the Transistors. If the drive pulse is present, check for a defective Driver Transistor. If there is no drive pulse on the base of the Driver Transistor, check the Buffer IC (1B, 2B or 4D) associated with that Transistor. If the driver circuit and the solenoid check good, check the pin on the print head for possible damage.

PAPER FEED MOTOR MALFUNCTIONING

If the printer will not advance the paper, check pins 2, 6, 8, 10 and 12 of Connector CN4 for good connections. If Connector CN4 is good, check the Paper Feed Motor (M1) windings. If any of the windings are open, replace the Paper Feed Motor.

If Connector CN4 and Paper Feed Motor check good, turn the Printer Off and then On again. Press the On Line button once. The On Line lamp should turn Off. If the On Line lamp does not turn Off, press the On Line button while monitoring pin 6 of Flip/Flop IC (9C). Pin 6 of IC 9C should alternate between logic High and logic Low each time the On Line button is pressed. A logic Low at pin 6 of IC 9C corresponds to the On Line condition. If pin 6 of IC 9C does not alternate between logic High and logic Low when the On Line button is pressed, replace IC 9C. If the alternations do occur at pin 6 of IC 9C, check IC 8D.

If the On Line lamp turns Off when the On Line button is pressed, press the LF (Line Feed) button and check to see if the Paper Feed Motor (M1) overheats. If the motor is not overheated, keep pressing the LF button and check for a logic Low at pin 37 of IC 7B. If pin 37 of IC 7B is not logic Low, check the function switch panel and the panel connector. If pin 37 of IC 7B is logic Low, check for 23.4V at the collector of Switch Transistor (Q19). If 23.4V is not present, check for a logic Low at pin 4 of IC 4D. If pin 4 is not logic Low, check IC 4D. If pin 4 of IC 4D is logic Low, check Transistors Q18 and Q21.

If the Paper Feed Motor (M1) is overheated, check for pulses at pins 3 and 5 of IC 2B when the LF button is pressed. If the pulses are not present at pins 3 and 5 of IC 2B, replace IC 7B. If the pulses are present at pins 3 and 5 of IC 2B, check Driver Transistors (Q14 through Q17). If the transistors check good, check IC 2B.

TIMING BELT (CARRIAGE) MOTOR MALFUNCTIONING

The Timing Belt Motor (M2) does not move the print head back and forth. Turn the Printer Off and move the print head to the center of the carriage. Turn the power back On and see if the print head moves. If the print head does not move, check for 23.4V at the collector of Switch Transistor (Q18). If 23.4V is missing at Q18, check for 23.4V at the emitter of Switch Transistor (Q27). If 23.4V is missing at the emitter of Q27, see the "Power Supply" section of this Troubleshooting guide. If 23.4V is present at the emitter of Q27, check for 23.4V at the emitter of Transistor Q18. If 23.4V is present at the emitter of Q18, check for a logic High at pin 1 of IC 4D. If pin 1 of IC 4D is not logic High, check Microcomputer IC (7B). If pin 1 is logic High, check for a logic Low at pin 2 of IC 4D. If pin 2 is not logic Low, check IC 4D. If pin 2 of IC 4D is logic Low, check Transistors Q18 and Q20.

If 23.4V is missing at the emitter of Q18, check for a logic High at pin 5 of IC 8D. If pin 5 of IC 8D is not logic High, replace IC 7B. If pin 5 is logic High, check for a logic High at pin 6 of IC 8D. If pin 6 is not logic High, check IC 8D. If pin 6 of IC 8D is logic High, check Switch Transistor (Q27).

If 23.4V is present at the collector of Q18, check the Timing Belt Motor (M2) windings. If a winding is open, replace the Timing Belt Motor. If the Timing Belt Motor windings are good, check for an overheated Timing Belt Motor. If the Timing Belt Motor is overheated, check IC 7B. If the motor is not overheated, check for 4.9V at the collector of Regulator Transistor (Q23). If 4.9V is present at the collector of Q23, check Connector CN4 and the printer mechanism. If the 4.9V is missing at the collector of Q23, check for 4.9V at the emitter of Q23. If the 4.9V is missing at the emitter of Q23, see the "Power Supply" section of this Troubleshooting guide. If 4.9V is present at the emitter of Q23, check for 4V at the cathode of Zener Diode ZD2. If the 4V is missing at the cathode, replace Zener Diode ZD2. If 4V is present at the cathode of ZD2, check Transistor Q23.

If the print head moves to the left when the Printer is turned On, check for a logic High at pin 9 of IC 9D. If pin 9 of IC 9D is not logic High, check for a defective home position detector. If pin 9 of IC 9D is logic High, check for a logic Low at pin 8 of IC 9D. If pin 8 of IC 9D is logic Low, check IC 7B. If pin 8 of IC 9D is not logic Low, check IC 9D.

VERIFY SENSOR OPERATION

Check the operation of the Home Position Sensor (Q98) by monitoring pin 9 of IC 9D with a logic probe while the print head is in the home position and the Printer turned On. If pin 9 of IC 9D does not read logic High with the print head in the home position, the Home Position Sensor is defective.

Check the operation of the head Timing Position Sensor (Q99) by turning On the Printer and monitoring pin 11 of IC 9D while manually moving the print head. The logic probe should indicate pulses at pin 11 of IC 9D while the print head is being moved. If pulses are not present at pin 11 of IC 9D, the head Timing Position Sensor is defective.

The operation of the Paper End Sensor Switch (SW99) can be checked by turning On the Printer and monitoring pin 11 of IC 4D while sliding a piece of paper in and out of Paper End Sensor Switch. When the paper is in behind the switch,

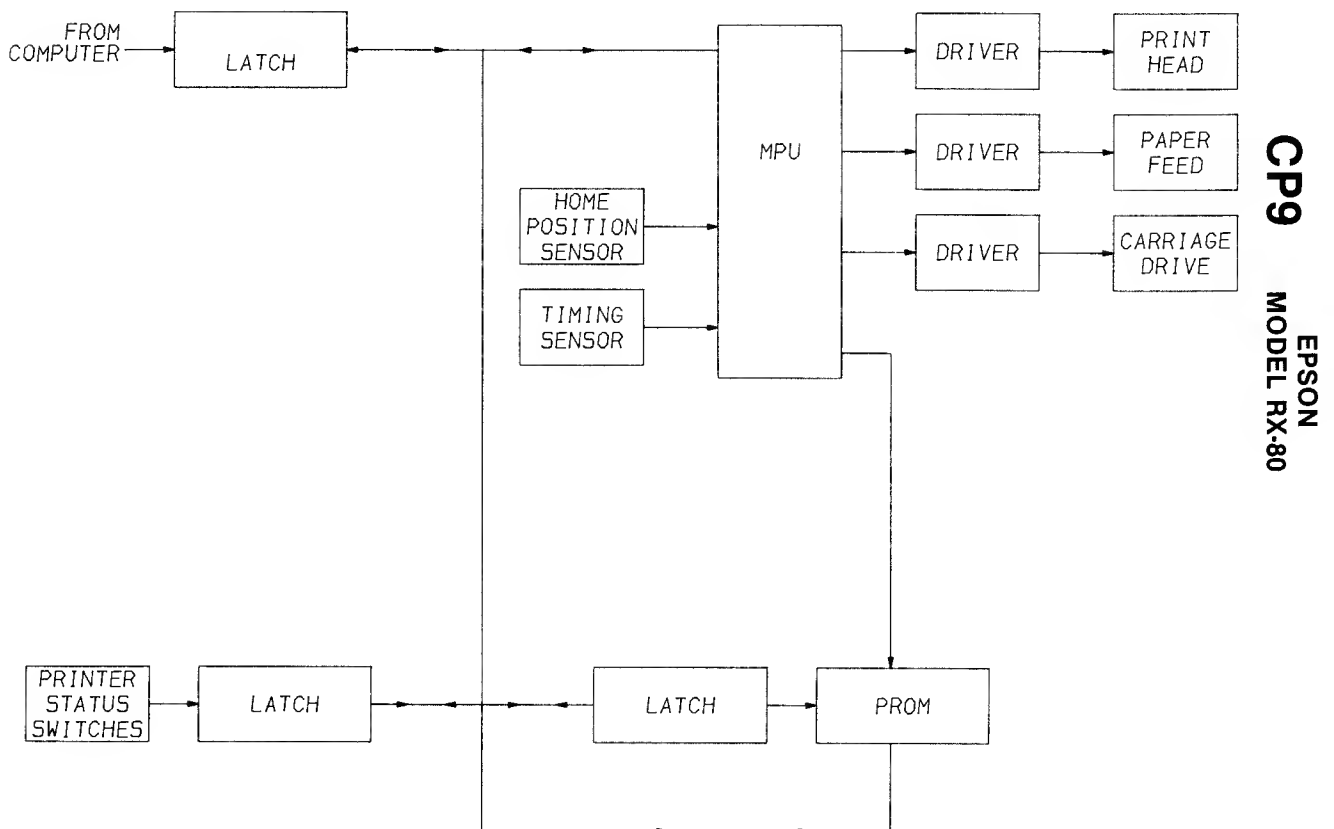
TROUBLESHOOTING (Continued)

pin 11 of IC 4D should be logic High. When the paper is removed, pin 11 should be logic Low. If the logic probe reading is not correct, the Paper End Sensor Switch is defective.

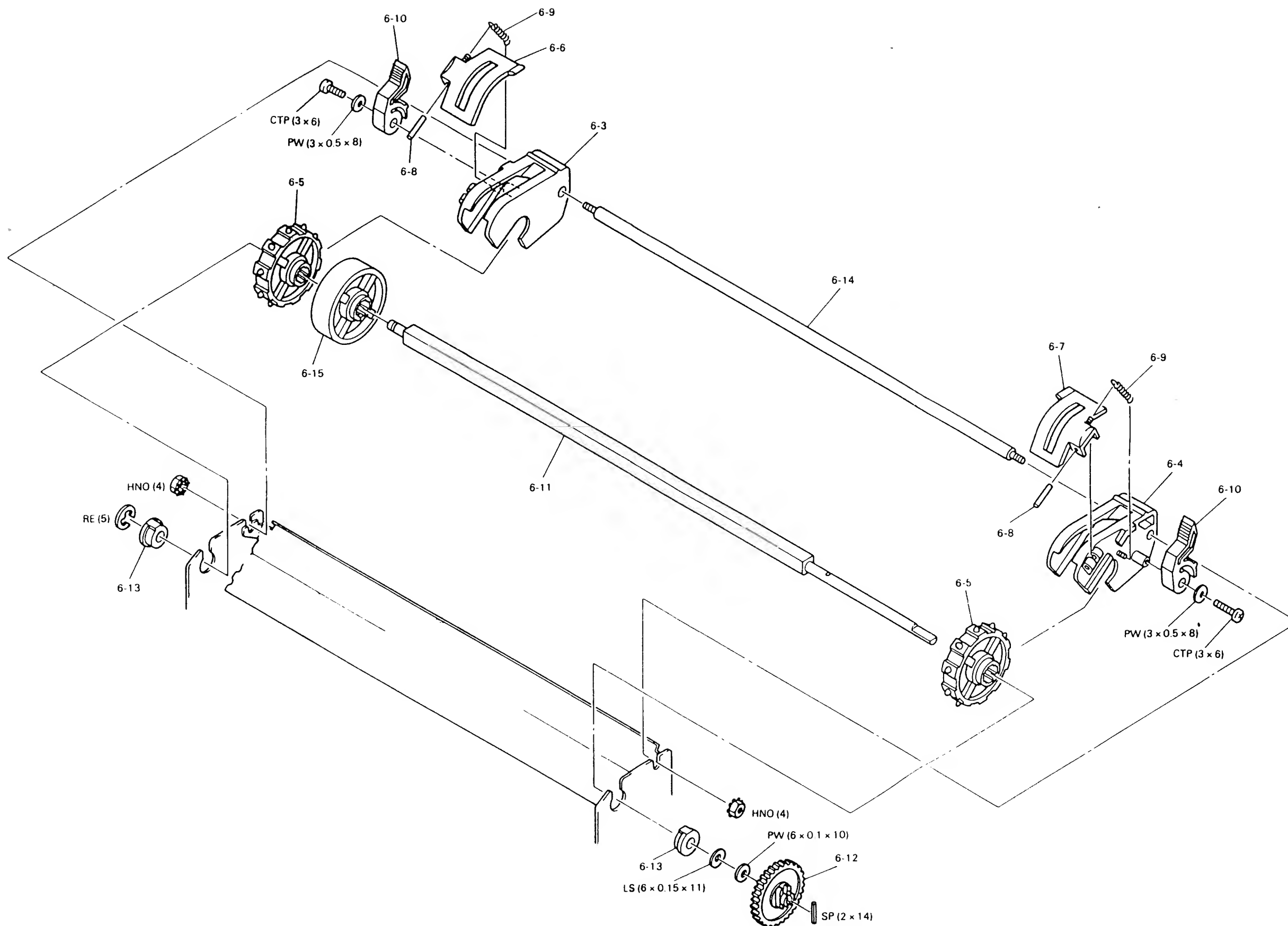
Voltages, waveforms and logic readings taken with the Printer on line and not printing unless noted. The self printing test mode was used for readings taken while printing.

Switches SW1 and SW2 were set as shown on the schematic.

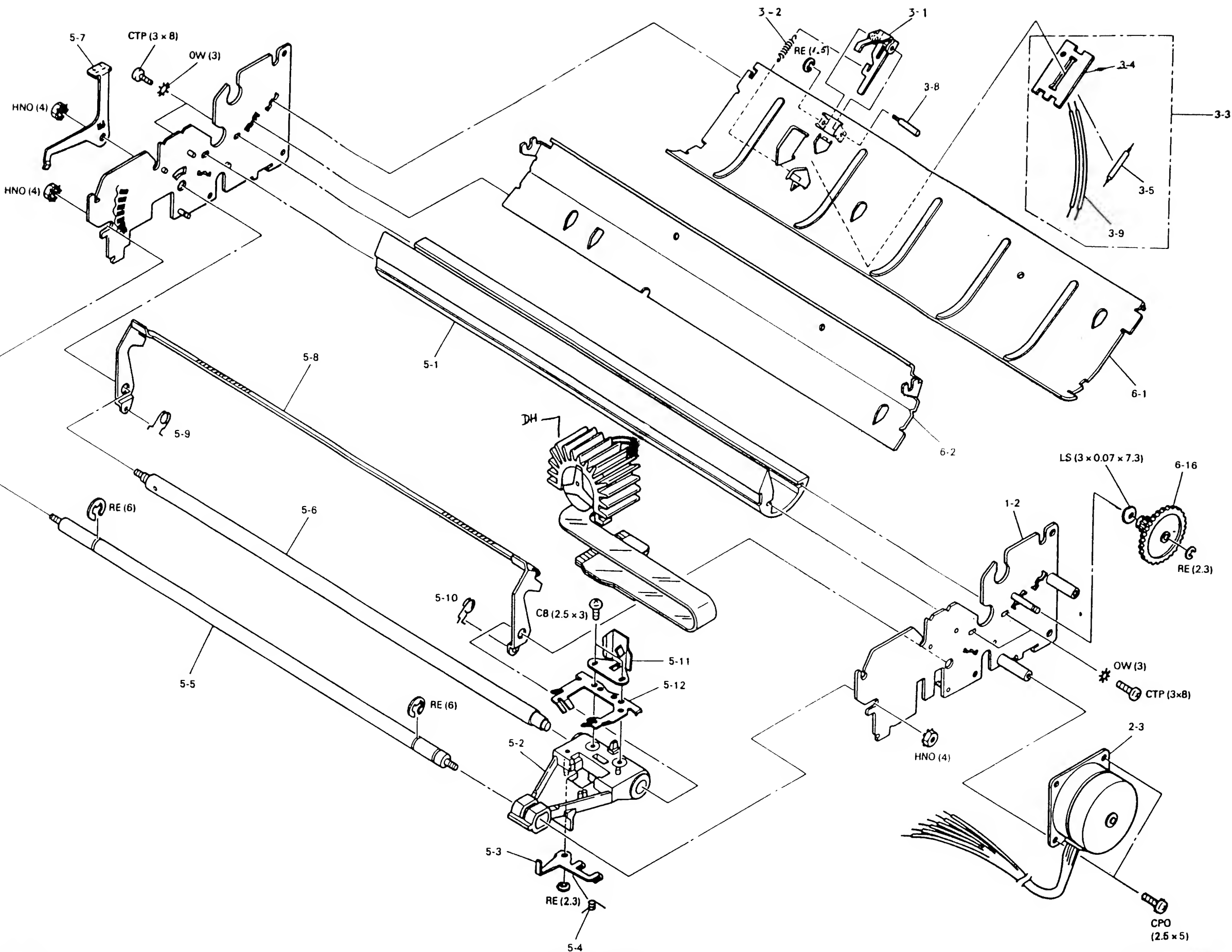
Waveforms taken with a triggered scope. The Sweep/Time switch was in the Calibrate position and the scope input was set for DC coupling on zero reference waveforms. Switch to AC coupling input to view waveforms after DC reference is measured when necessary. Each waveform is 7cm wide with the DC reference voltage given at the bottom line of each waveform. The sweep time is in $\mu\text{Sec. per cm.}$ and peak-to-peak voltage reading are given at the end of each waveform.



BLOCK DIAGRAM



Courtesy of Epson America, Inc.



Courtesy of Epson America, Inc.

LOGIC CHART

PIN NO.	IC 4A	PIN NO.	IC 6A	PIN NO.	IC 6A	PIN NO.	IC 7A	IC 8A	IC 1B	IC 2B	IC 3B	IC 5B
1	H	1	H	17	P	1	L	H	P(1)	P(2)	P(2)	L
2	P	2	P	18	P	2	P	P	P(2)	P	P	P(1)
3	H	3	P	19	P	3	P	H	P(1)	P(4)	H	P
4	H	4	P	20	L	4	P	H	P(2)	P	H	P
5	P	5	P	21	P	5	P	P	P(1)	P(4)	H	P(1)
6	P	6	P	22	P	6	P	P	P(2)	P	H	P(1)
7	H	7	P	23	P	7	P	H	L	L	L	P
8	H	8	P	24	P	8	P	H	P(2)	P(2)	L	P
9	P	9	P	25	P	9	P	P	P(1)	P(1)	P(4)	P(1)
10	L	10	P	26	P	10	L	L	P(2)	P(2)	P	L
11	L	11	P	27	H	11	P	H	P(1)	P(1)	P(4)	P
12	P	12	P	28	H	12	P	P	P(2)	P	P	P(1)
13	H	13	P			13	P	H	P(1)	P(1)	P(1)	P
14	H	14	L			14	P	L	H	H	H	P(1)
15	P	15	P			15	P	P				P(1)
16	P	16	P			16	P	P				P(1)
17	H					17	P	L				P
18	H					18	P	L				P
19	P					19	P	P				P(1)
20	H					20	H	H				H
PIN NO.	IC 7B	PIN NO.	IC 7B	PIN NO.	IC 7B	PIN NO.	IC 7B	PIN NO.	IC 9B	IC 9C	IC 10C	
1	L(1)	21	P(2)	41	H	61	P	1	L	P(1)	(5)	
2	H	22	P(2)	42	H	62	P	2	L	H(2)		
3	H	23	P(1)	43	H	63	H	3	H	L		
4	L	24	L	44	P	64	H	4	H	H		
5	H	25	H	45	P(1)			5	L	L(1)		
6	H	26	P	46	L			6	L	H(2)		
7	P(2)	27	P	47	P(1)			7	L	L		
8	P(1)	28	H	48	P			8	L	L		
9	P(2)	29	P	49	P(1)			9	H	H		
10	P(1)	30	P	50	P			10	L	L		
11	P(4)	31	P	51	P			11	L	L		
12	P(4)	32	L	52	P			12	L	L		
13	P(4)	33	L	53	P			13	H	H		
14	P(4)	34	H	54	P			14	H	H		
15	P(4)	35	*	55	P			15				
16	H	36	H	56	P			16				
17	P(1)	37	H	57	P			17				
18	H	38	H	58	P			18				
19	H(2)	39	*	59	P			19				
20	H	40	H	60	P			20				

NOTE: Logic probe readings taken with Printer On Line and in self-test mode unless otherwise noted. Switches SW1 and SW2 set as shown on schematic.

Logic Probe Display

L = Low

H = High

P = Probe

* = Open (No lights On)

(1) Probe indicates H when printhead is at home position.

(2) Probe indicates L when printhead is at home position.

(3) No indication when printhead is at home position.

(4) Probe indicates P during line feed.

(5) No logic reading taken.

CP9
EPSON
MODEL RX-80

LOGIC CHART (Continued)

PIN NO	IC 4D	IC 5D	IC 6D	IC 7D	IC 8D	IC 9D
1	P(4)	P	H	P	L(1)	H
2	L	P	P	P	L(1)	L
3	P(4)	P	P	H	H	H
4	L	H	H	H	H	L
5	P(1)	L	P	H	P(4)	H
6	P(2)	H	P	H	P(1)	L
7	L	L	L	L	L	L
8	H(2)	P(2)	L	P(1)	L(1)	P(2)
9	L(1)	H	H	P(1)	L(1)	P(1)
10	L	H	H	P	H(2)	P(2)
11	H	L	P(1)	P	H(2)	P(1)
12	L	H	H	P	H(2)	L
13	H	H	H	P	H(2)	H
14	H	H	H	H	H	H
15						
16						

NOTE: Logic probe readings taken with Printer On Line and in self-test mode unless otherwise noted. Switches SW1 and SW2 set as shown on schematic.

Logic Probe Display

L = Low

H = High

P = Probe

* = Open (No lights On)

- (1) Probe indicates H when printhead is at home position.
- (2) Probe indicates L when printhead is at home position.
- (3) No indication when printhead is at home position.
- (4) Probe indicates P during line feed.
- (5) No logic reading taken.

PARTS LIST AND DESCRIPTION

When ordering parts, state Model, Part Number, and Description

SEMICONDUCTORS (Select replacement transistor for best results)

ITEM No.	TYPE No.	MFR. PART No.	REPLACEMENT DATA					ZENITH PART No.
			GENERAL ELECTRIC PART No.	NTE PART No.	ECG PART No.	RCA PART No.	WORKMAN PART No.	
D1,2 D3,4 D5,6	V19B 1S2075K TB4.1	X320010450 X320010079	GE-511 GE-514 GE-504A	NTE552 NTE519 NTE116	ECG552 ECG519 ECG116	SK9000/552 SK3100/519 SK3311	WEP172/506 WEP925/519 WEP156	103-287 103-131 212-76-02
DB1	S5277B 3B4.1 3B4B41	X320010240 X340400060	GE-504A GE-5312 GE-5312	NTE116 NTE5312 NTE5312	ECG116 ECG5312 ECG5312	SK3311 SK3985/5312 SK3985/5312	WEP156 WEP1065 WEP1065	212-76-02
DB2	1B4.1 1B4B1 2SC3293	X340400030 X302329300	GE-5304 GE-5304	NTE5304 NTE5304	ECG5304 ECG5304	SK3106/5304 SK3106/5304	WEP1053 WEP1053	
Q1 thru Q17 Q18,19	2SB772Q	X301077251		NTE374	ECG374	SK9042/374	WEP374/374	121-29105
Q20,21 Q22,23	2SC1815-0 2SA933S	X302181502	GE-62	NTE85	ECG85	SK3124A/289A	WEP66/199	121-29065
Q24,25	2SA1015Y 2SA1015GR 2SA1015Y	X300101502 X300101502 X300101502	GE-269 GE-269 GE-269	NTE290A NTE290A NTE290A	ECG290A ECG290A ECG290A	SK9132 SK9132 SK9132	WEP911/290A WEP911/290A WEP911/290A	121-29003 121-29003 121-29003
Q26 Q27,28 Q98 Q99 SR1	2SC2516 2SB772Q B2 261 B1 211 F78L05AWC	X302251600 X301077251 F304059000(1) F303030000(2) X440078051		NTE54 NTE374	ECG54 ECG374	SK9366/54 SK9042/374	WEP374/374	121-29105
ZD1 ZD2 ZD3 ZD4 1B,2B	HZ5C-1 HZ4A-2 HZ11A-3 HZ5B-2 SN74LS05N	X3300000582 X3300000542 X3300000342 X3300000059 X420300050	GEVR-100 GEZD-5.1	NTE977 NTE5010A	ECG977 ECG5010A	SK3462/977 SK5A1/5010A	WEP1411/5010	221-29044 103-279-10
3B 4A 4D 5B 5D	SN7417N SN74LS373N SN74LS05N SN74LS373N SN74LS00N	X420100170 X420303730 X420300050 X420303730 X420300000	GEZD-4.7 74LS05 GE-7417 74LS373 74LS05 74LS373 74LS00	NTE5019T1 NTE5009A NTE74LS05 NTE7417 NTE74LS373 NTE74LS05 NTE74LS373 NTE74LS00	ECG5019T1 ECG5009A ECG74LS05 ECG7417 ECG74LS373 ECG74LS05 ECG74LS373 ECG74LS00	SK4A7/5009A SK74LS05 SK7417 SK74LS373 SK74LS05 SK74LS373 SK74LS00	WEP1409/5009	103-279-09 HE-443-818 HE-443-72 HE-443-867 HE-443-818 HE-443-867 HE-443-728

PARTS LIST AND DESCRIPTION (Continued)

When ordering parts, state Model, Part Number, and Description

SEMICONDUCTORS (Select replacement transistor for best results)

ITEM No.	TYPE No.	MFG. PART No.	REPLACEMENT DATA					
			GENERAL ELECTRIC PART No.	NTE PART No.	ECG PART No.	RCA PART No.	WORKMAN PART No.	ZENITH PART No.
6A	M64200CA	Y435800801						
	2764-RX8-R1	Y435800501						
	2764-RX8-R2	Y435800701						
	2764-2/2764-25	Y435800702						
6D	SN74LS74AN	X420300740	74LS74A	NTE74LS74A	ECG74LS74A	SK74LS74A		HE-443-730
7A	SN74LS373N	X420303730	74LS373	NTE74LS373	ECG74LS373	SK74LS373		HE-443-867
7B	C78010BD031							
	uPD7810G	X400078100						
	78010BB	Y440801001						
	C78020BA	Y490801601						
7D	SN74LS32N	X420300320	74LS32	NTE74LS32	ECG74LS32	SK74LS32		HE-443-875
8A	SN74LS373N	X420303730	74LS373	NTE74LS373	ECG74LS373	SK74LS373		HE-443-867
8D	SN7407N	Y420100070		NTE7407	ECG7407	SK7407		
9B	SN74LS02N	X420300020	74LS02	NTE74LS02	ECG74LS02	SK74LS02		HE-443-779
9C	SN74LS74AN	X420300740	74LS74A	NTE74LS74A	ECG74LS74A	SK74LS74A		HE-443-730
9D	TC4584BP	X460458400						
10C	uPC305C	X440193050		NTE1930	ECG1930	SK7643/1930		HE-442-24

(1) Assembly, Includes P.C. Board.

(2) Assembly, Includes P.C. Board and wires.

WIRING DATA

Shielded Hook-up Wire Use BELDEN No. 8401 or 8421 (Single-Conductor)

8208 (Two-Conductor)

General-use Unshielded Hook-up Wire Use BELDEN No. 8529 (Solid) Available in 13 Colors

8522 (Stranded) Available in 13 Colors

PARTS LIST AND DESCRIPTION (Continued)

When ordering parts, state Model, Part Number, and Description

RESISTORS (Power and Special)

ITEM No.	RATING	REPLACEMENT DATA		
		MFGR. PART No.	NTE PART No.	WORKMAN PART No.
R22	1800 1% 1/4W Metal Film	X141411812		
R76	8250 1% 1/4W Metal Film	X141418312		
RM1	Resistor Network (1)	X110803320		
RM2	Resistor Network (1)	X110803320		
RM3	Resistor Network (2)	X110883320		
RM4	Resistor Network (2)	X110883320		
RM5	Resistor Network (3)	X110891520		
RM6	Resistor Network (4)	X110881820		

(1) Contains ten (10 ea.) 3300 10% 1/8W

(2) Contains eight (8 ea.) 3300 10% 1/8W

(3) Contains nine (9 ea.) 1500 10% 1/8W

(4) Contains eight (8 ea.) 1800 10% 1/8W

COILS (RF-IF)

ITEM No.	FUNCTION	MFGR. PART No.
L1	Choke	Y435201003
L1A	Line Choke	

ITEM No.	FUNCTION	MFGR. PART No.
L2	Choke	Y435201002

EPSON
MODEL RX-80

TRANSFORMER (Power)

ITEM No.	RATING			REPLACEMENT DATA		
				MFGR. PART No.		NOTES
	PRI.	SEC. 1	SEC. 2			
T1	120V AC @ 470mA AC	11.37V AC	11.13V AC @ 950mA AC	Y435501300 (CT-P8RU) On Unit		
	SEC. 3	SEC. 4	SEC. 5			
	30.7V AC @ 1530mA AC					

FUSE DEVICES

ITEM NO.	DESCRIPTION	MFGR. PART NO.		NOTES
		DEVICE	HOLDER	
F1	1A @ 250V Slow Blow 315mA	X502040020 X502050020 (1)		

(1) Used in European models.

PARTS LIST AND DESCRIPTION (Continued)

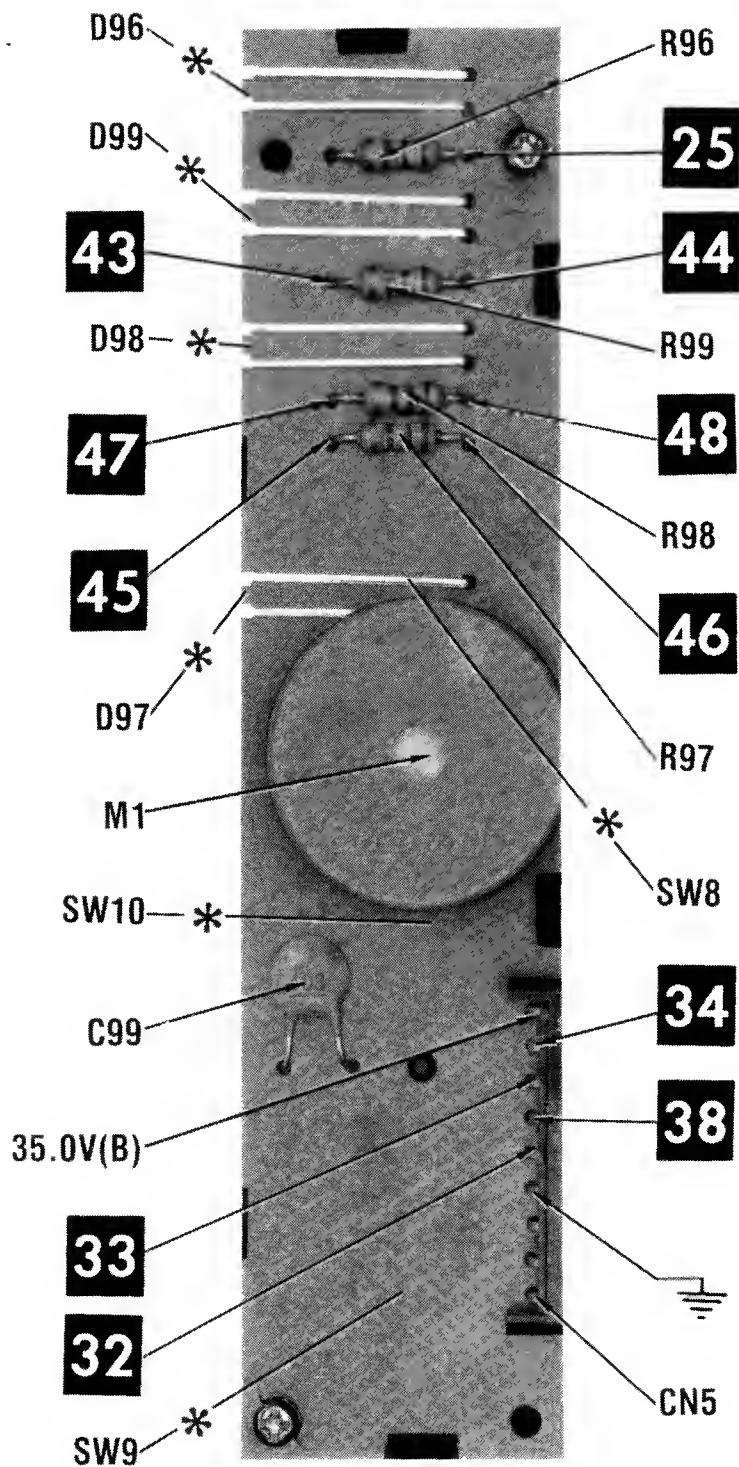
When ordering parts, state Model, Part Number, and Description

MISCELLANEOUS

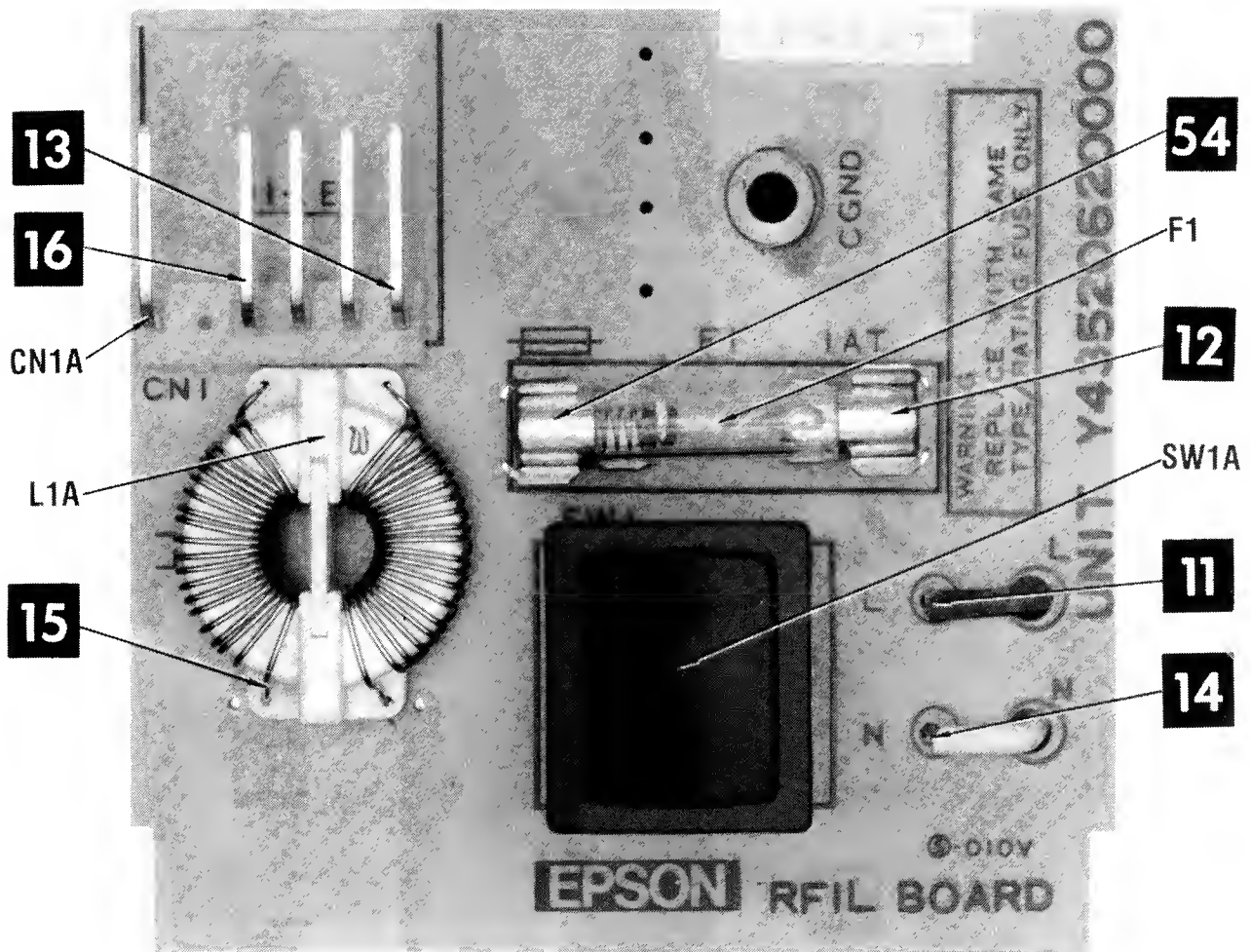
ITEM No.	PART NAME	MFGR. PART No.	NOTES
CR1	Crystal	X504003400	11MHz
D96	LED		Power, Grn
D97	LED		On Line, Grn
D98	LED		Paper Out, Red
D99	LED		Ready, Grn
H1	Head	F401700000	Print
M1	Motor	F316016000	Paper Feed
M2	Motor	F316014000	Carriage Drive
M3	Buzzer		
SW1	Switch	X620400850	Printer Status
SW1A	Switch		Power
SW2	Switch	X620400910	Line Feed Status
SW8	Switch		On Line
SW9	Switch		Line Feed
SW10	Switch		Form Feed
SW99	Switch	A170202501	Paper End

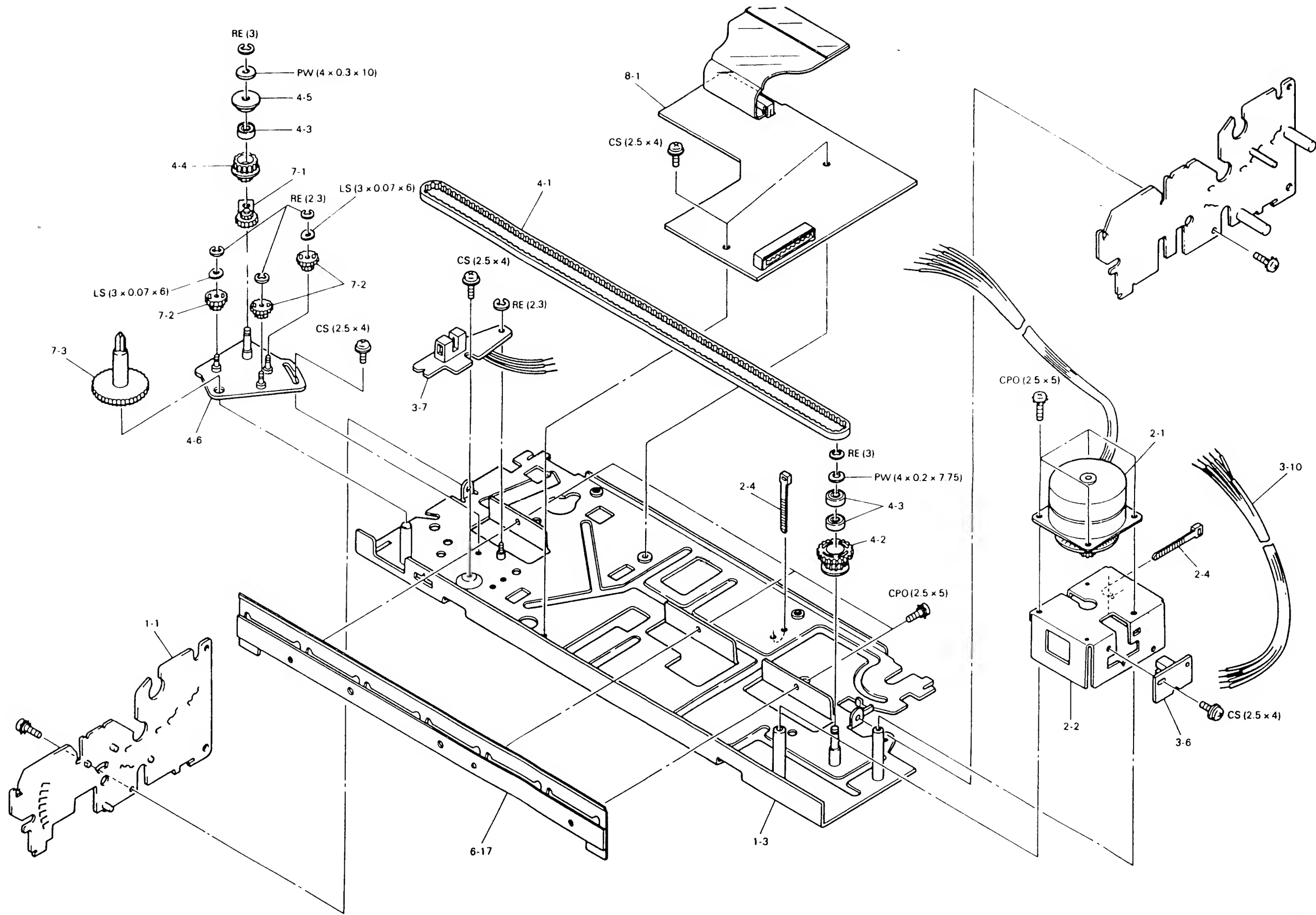
CABINETS & CABINET PARTS (When ordering specify model, chassis & color)

ITEM	PART No.	ITEM	PART No.
Lower Case	Y435001001	Separator Cover	Y435007001
Upper Case	Y435000001	Knob, Paper Feed	Y435009001
Printer Cover	Y435004001		



* LOCATED OTHER SIDE OF BOARD



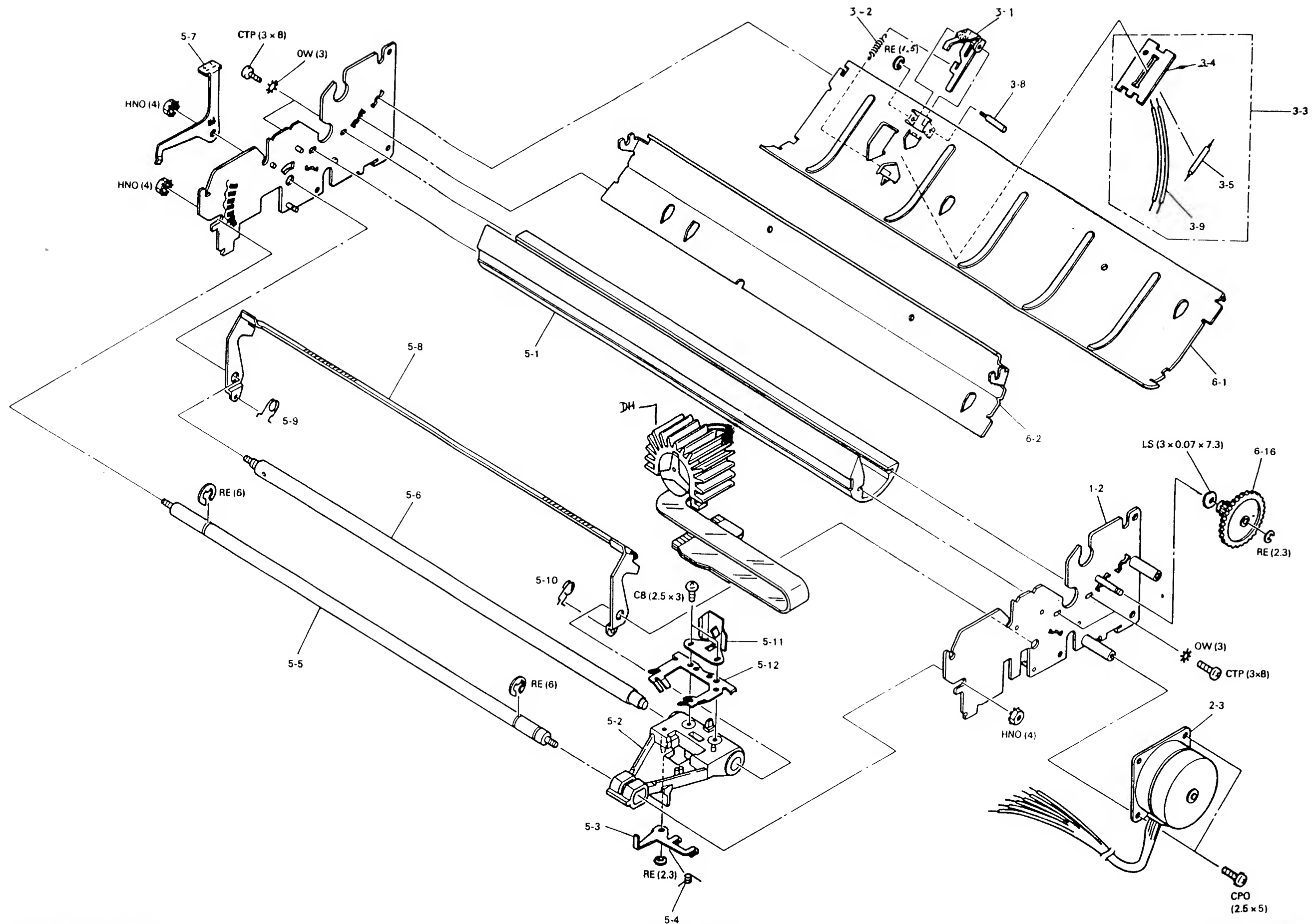


PRINTER MECHANISM

Courtesy of Epson America, Inc.

PRINTER MECHANISM

EPSON
MODEL RX-80

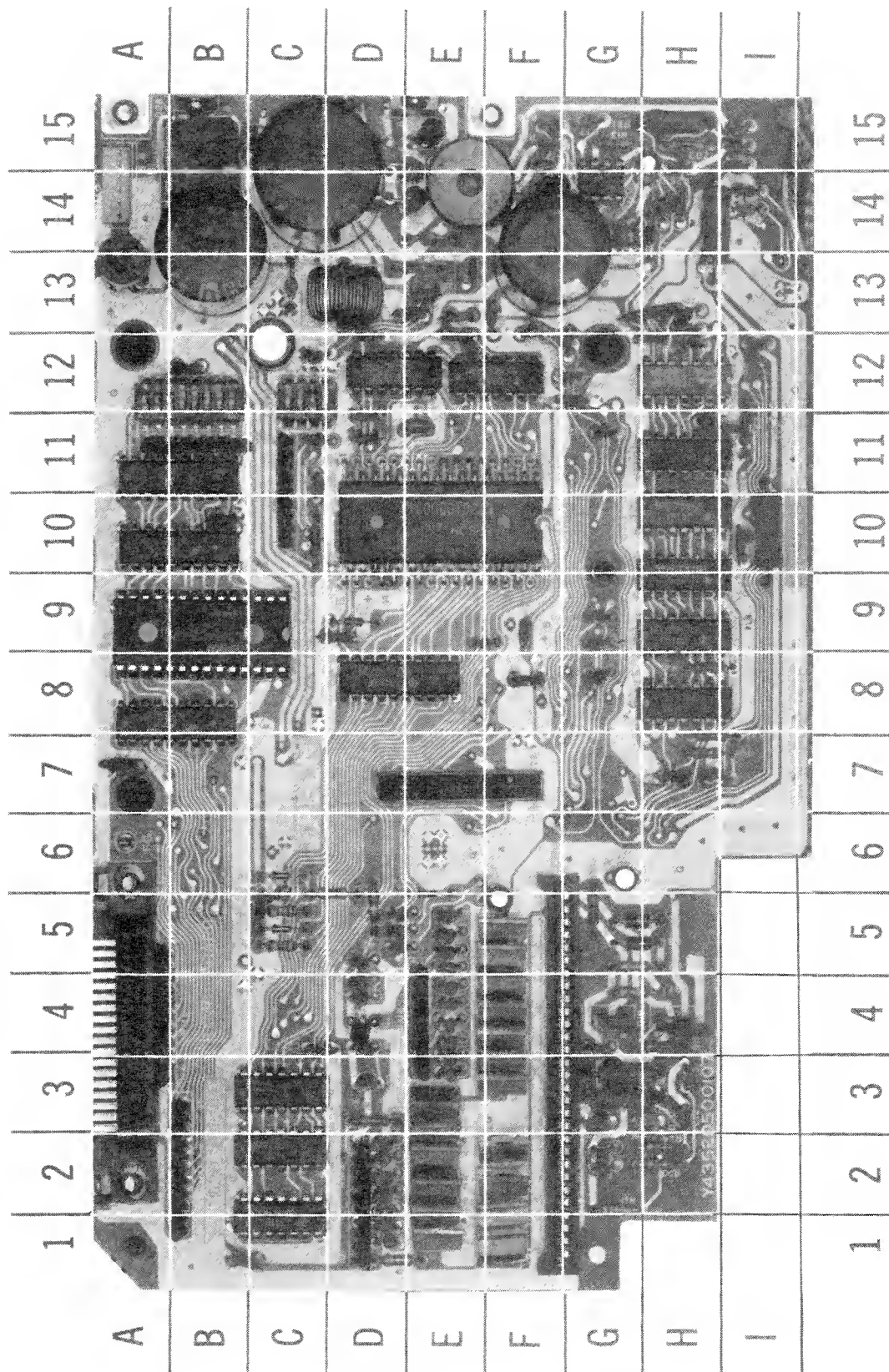


PRINTER MECHANISM

PRINTER MECHANISM

Courtesy of Epson America, Inc.



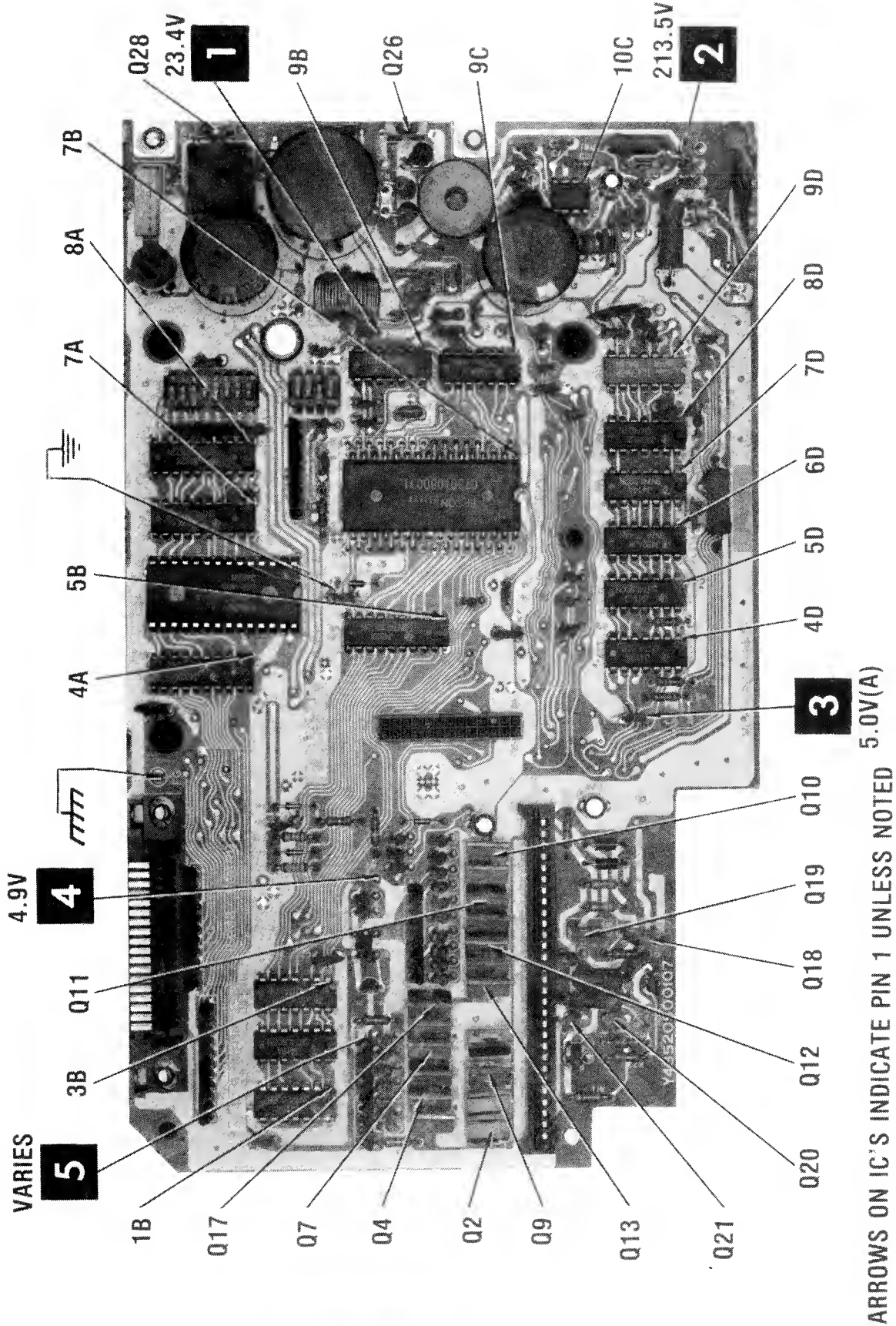


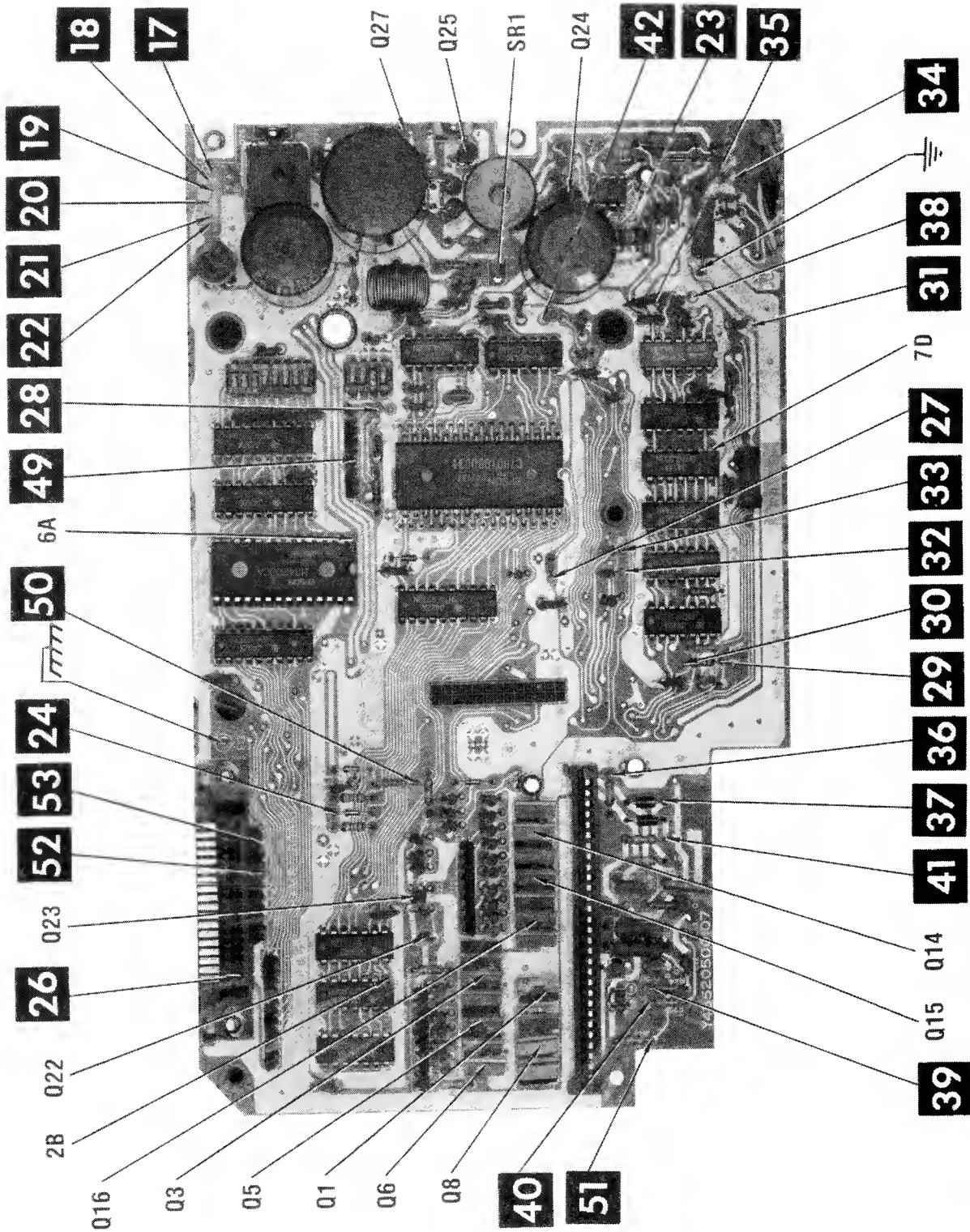
MAIN BOARD

A Howard W. Sams GRIDTRACE™ Photo

MAIN BOARD GridTrace LOCATION GUIDE

C1	C-15	CN4	G-3	Q26	E-15	R35	H-12	R72	H-14	7D	H-10
C2	B-14	CR1	E-11	Q27	D-15	R36	I-12	R73	G-15	8A	B-11
C3	F-14	D1	E-14	Q28	B-15	R37	I-7	R74	F-15	8D	H-11
C4	C-12	D2	C-13	R1	G-4	R38	F-12	R75	H-14	9B	D-12
C5	E-13	D3	E-6	R2	G-5	R39	D-5	R76	C-5	9C	F-12
C6	F-5	D4	C-6	R3	H-14	R40	D-5	R77	C-15	9D	H-12
C7	H-15	D5	G-5	R4	E-15	R41	H-8	R78	C-12	10C	G-14
C8	C-5	D6	G-5	R5	E-14	R42	H-13	R79	E-13		
C9	D-11	DB1	B-15	R6	I-10	R43	I-15	R80	D-13		
C10	D-11	DB2	A-13	R7	D-5	R44	I-14	R81	H-15		
C11	H-13	L1	E-14	R8	F-13	R45	I-14	R82	I-11		
C12	H-3	L2	D-13	R9	H-7	R46	G-2	R83	G-5		
C13	H-3	Q1	F-2	R10	D-4	R47	G-2	R84	G-12		
C14	F-13	Q2	F-1	R11	G-2	R48	D-2	RM1	B-2		
C15	H-7	Q3	E-3	R12	D-5	R49	D-1	RM2	A-4		
C16	H-12	Q4	E-2	R13	G-15	R50	D-5	RM3	B-11		
C17	E-13	Q5	E-2	R14	I-15	R51	D-2	RM4	C-11		
C18	G-14	Q6	E-1	R15	H-13	R52	D-2	RM5	D-2		
C19	H-14	Q7	E-2	R16	G-3	R53	D-1	RM6	E-4		
C20	B-1	Q8	F-2	R17	H-4	R54	D-2	SR1	E-13		
C21	C-4	Q9	F-2	R18	G-3	R55	D-1	SW1	B-12		
C22	A-7	Q10	F-5	R19	G-4	R56	D-2	SW2	C-12		
C23	H-7	Q11	F-4	R20	D-6	R57	E-5	ZD1	D-9		
C24	F-8	Q12	F-4	R21	F-15	R58	E-4	ZD2	C-5		
C25	D-9	Q13	F-3	R22	C-5	R59	E-4	ZD3	H-15		
C26	B-12	Q14	F-5	R23	H-2	R60	E-3	ZD4	H-14		
C27	E-13	Q15	F-4	R24	H-2	R61	E-5	1B	C-1		
C28	E-13	Q16	F-3	R25	H-15	R62	E-4	2B	C-2		
C29	G-6	Q17	E-3	R26	D-15	R63	E-4	3B	C-3		
C30	C-11	Q18	H-4	R27	F-9	R64	E-4	4A	B-8		
C31	H-11	Q19	G-4	R28	C-11	R65	E-5	4D	H-8		
C32	B-10	Q20	H-3	R29	G-8	R66	E-5	5B	D-8		
C33	G-9	Q21	G-3	R30	C-10	R67	I-15	5D	H-9		
C34	I-10	Q22	D-3	R31	E-9	R68	D-5	6A	B-9		
CN1	A-4	Q23	D-4	R32	G-11	R69	D-4	6D	H-9		
CN2	A-14	Q24	F-14	R33	G-9	R70	D-4	7A	B-10		
CN3	E-7	Q25	E-15	R34	G-9	R71	F-15	7B	E-10		





ARROWS ON IC'S INDICATE PIN 1 UNLESS NOTED

EPSON
MODEL RX-80

MISCELLANEOUS ADJUSTMENTS

PTS (HEAD POSITION) SENSOR ADJUSTMENT

Connect Channel A of a dual trace scope to pin 10 of IC 9D and set the horizontal sweep time to .5mSec. Set the scope to trigger on the positive edge of the waveform. Hold down the LF button while turning the Printer On to activate the self printing test mode. Loosen the screw holding the PTS (Position Timing Signal) Sensor Board on the right side of the Timing Belt Motor (M2). Use a screwdriver in the slot provided to adjust the PTS Sensor Board for a pulse width of approximately 1.67mSec while the Printer is in the self printing test mode. See Figure 1.

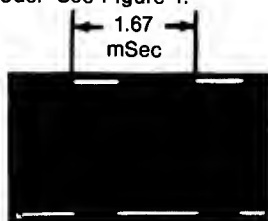


Figure 1

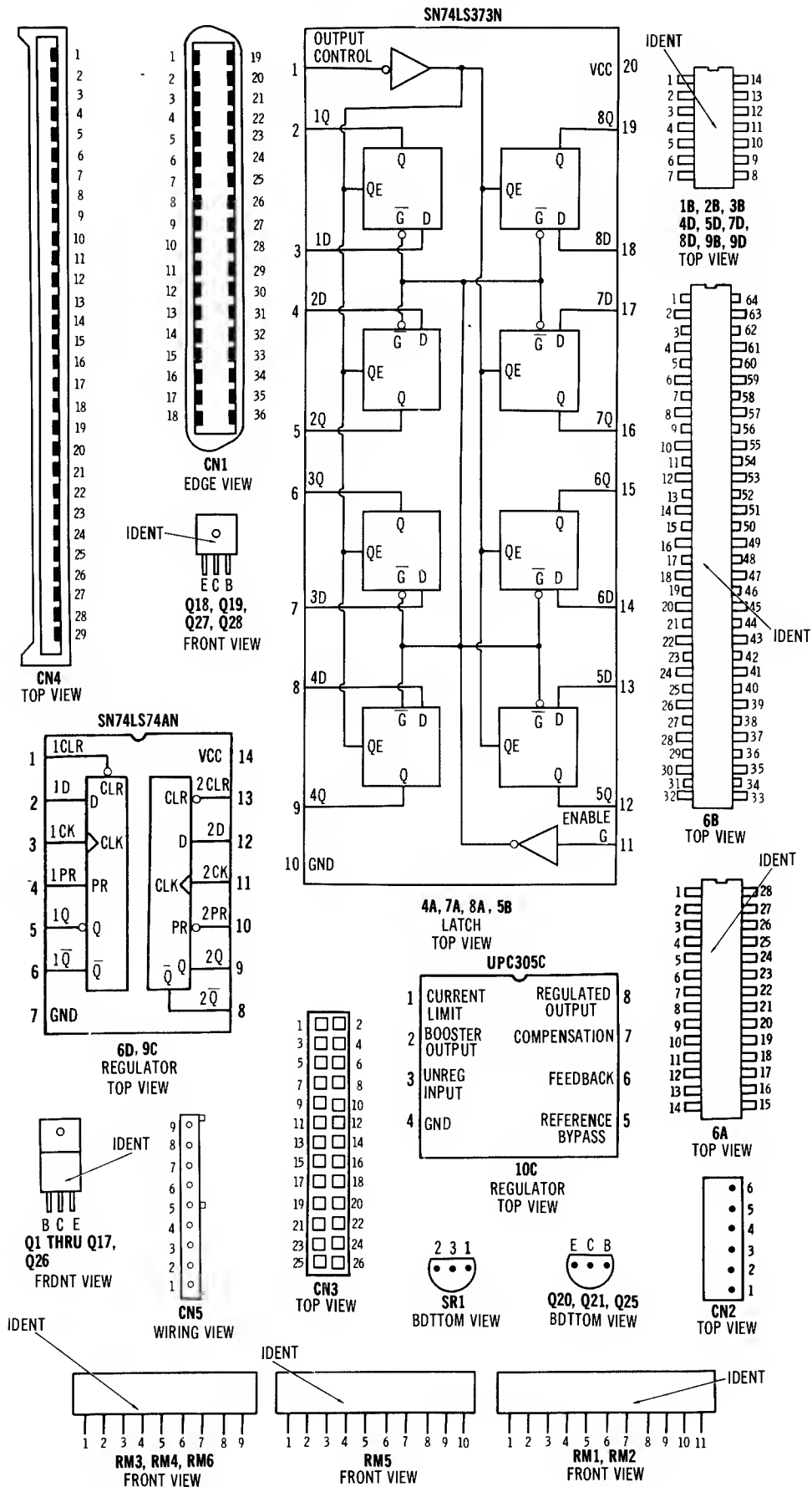
HOME POSITION SENSOR ADJUSTMENT

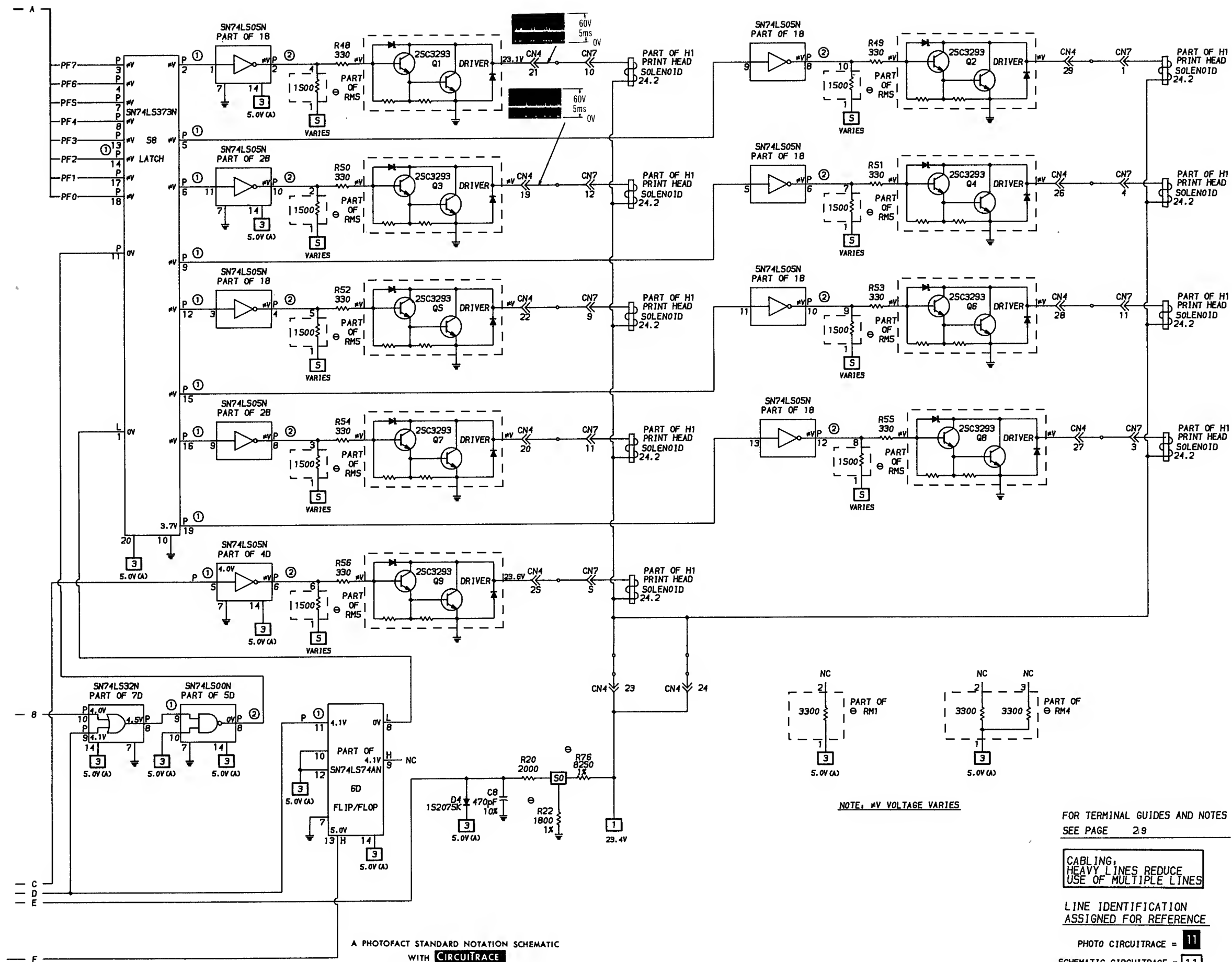
Loosen the screw holding the Home Position Sensor Board. Use a small flat screwdriver in the notch provided to adjust the Home Position Sensor Board. Move the notch to the left to move the margin left or move the notch to the right to move the margin right. Install the Ribbon Cartridge and perform the self printing test to test the margin position. Repeat this test until printing begins at the desired position on the paper. When the desired position is obtained, tighten the Home Position Sensor Board mounting screw.

TIMING BELT ADJUSTMENT

Loosen the adjustment screw on the belt tension plate. Tighten the belt until no more than 1/4 inch movement occurs on the Printhead when it is at either end of the carriage shaft and the belt is pressed inward. Tighten the adjustment screw on the belt tension plate. Run the Printer in self-test mode and note the distance between characters. The distance should be the same.

IC PINOUTS & TERMINAL GUIDES





A PHOTOFACT STANDARD NOTATION SCHEMATIC
WITH CIRCUITRACE
© Howard W. Sams & Co., Inc. 1985

SCHEMATIC NOTES

→ Circuitry not used in some versions

--- Circuitry used in some versions

• See parts list

≡ Ground

Voltages measured with digital meter.

Waveforms and voltages are taken from ground, unless noted otherwise.

Voltages, waveforms and logic readings taken with printer On Line and in self-test mode unless otherwise noted.

Switches SW1 and SW2 set as shown on schematic.

Waveforms taken with triggered scope and Sweep/Time switch in Calibrate position, scope input set for DC coupling on "0" reference voltage waveforms. Switch to AC input to view waveforms after DC reference is measured when necessary. Each waveform is 7.5cm width with DC reference voltage given at the bottom line of each waveform. Time in μs per cm, given with p-p reading at the end of each waveform.

Item numbers in rectangles appear in the alignment/adjustment instructions.

Supply voltage maintained as shown at input.

Controls adjusted for normal operation.

Terminal identification may not be found on unit.

Resistors are $\frac{1}{2}\text{W}$ or less, 5% unless noted.

Value in () used in some versions.

NOTE: Logic probe readings taken with printer On Line and in self-test mode unless otherwise noted. Switches SW1 and SW2 set as shown on schematic.

Logic Probe Display

L = Low

H = High

P = Pulse

* = Open (No lights On)

(1) Probe indicates H when printhead is at home position.

(2) Probe indicates L when printhead is at home position.

(3) No indication when printhead is at home position.

(4) Probe indicates P during line feed.

(5) No logic reading taken.

DISASSEMBLY INSTRUCTIONS

CABINET UPPER CASE REMOVAL

Remove paper feed knob. Remove printer lid. Remove two screws holding upper case. Disconnect control panel connector and remove upper case.

POWER SUPPLY BOARD REMOVAL

Disconnect power transformer from Power Supply board and remove one screw holding board and one screw holding ground lead of power cord and remove the Power Supply board.

MAIN BOARD REMOVAL

Disconnect ground Connector FG, Connector CN2, and the Printer Mechanism ribbon cable. Remove three screws holding Main board to cabinet bottom. Remove two screws holding heat sink to cabinet bottom. Push back two plastic retaining tabs and remove Main board from cabinet.

PRINTER MECHANISM REMOVAL

Disconnect printer mechanism ribbon cable from main board. Remove two screws holding the mechanism to lower case assembly. Remove one screw on right hand side of paper feed motor holding ground strip. Slide mechanism forward and remove from unit.

PRINthead REMOVAL

Slide Printhead to left of carriage to allow access to Printhead Cable. Disconnect Printhead Cable by pulling the plastic tab attached to bottom of Printhead Cable. Slide Printhead to center position for access to Head Lock Lever. Rotate lever left to release Printhead. Lift Printhead straight up to remove from Carriage assembly.

HOME POSITION SENSOR REMOVAL

Unsolder three Home Position Sensor wires from Printhead Connector board. Remove one screw holding Home Position Sensor to chassis. Remove Home Position Sensor.

POSITION TIME SENSOR (PTS) REMOVAL

Unsolder four wires from the PTS Sensor board. Remove one screw holding PTS Sensor to Carriage Motor assembly. Remove PTS Sensor from Carriage Motor.

TIMING BELT MOTOR REMOVAL

Remove the Printhead. Refer to Printhead removal. Remove wire tie from Timing Belt Motor wires. Remove four screws holding Timing Belt Motor to chassis. Unsolder the six Timing Belt Motor wires from terminal board located under Carriage assembly. Timing Belt Motor may now be removed.

PAPER FEED MOTOR REMOVAL

Unsolder the six Paper Feed Motor wires from terminal board located under Carriage assembly. Remove two screws holding Paper Feed Motor to Carriage assembly and remove motor.

PAPER END ASSEMBLY REMOVAL

Unsolder two wires from Paper End assembly. Unhook Paper End lever spring from outer paper guide. Bend back metal tabs holding Paper End circuit board and remove.

TIMING BELT REMOVAL

Remove Printer mechanism from case. See Disassembly Instructions. Press downward on the Timing Belt at each side of the point where belt is attached to Carriage Assembly. CAUTION: Belt may be held in place with adhesive cement. If removal is difficult, slide the Carriage Assembly to the right and over the access hole in the chassis base. Turn the chassis over. Carefully cut the adhesive seal with a razor blade and remove the belt from the Carriage Assembly with needle-nose pliers.

Loosen the screw securing the Belt Tension Plate and remove the Timing Belt from the belt-driven pulley. Remove Timing Belt Motor from the Printer base for access to the belt drive pulley. Remove belt from pulley. Push belt through opening in right frame and remove belt from Printer.

Install replacement by reversing the removal procedure. Before adjusting tension, apply a drop of adhesive cement where Timing Belt is attached to Carriage Assembly and allow to dry. See Timing Belt Adjustment in Miscellaneous Adjustments.

MECHANICAL PARTS LIST

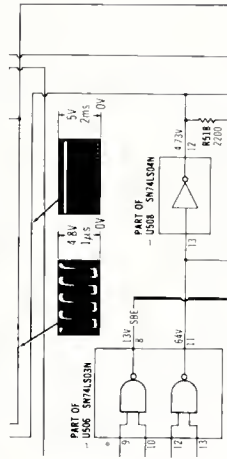
REF. NO.	PART NO.	DESCRIPTION
1-1	F308003000	Frame L Assembly
1-2	F308004000	Frame R Assembly
1-3	F316006000	Base Frame H Assembly
2-1	F316014000	Timing Belt Motor Assembly
2-2	F303026010	Motor Heat Sink
2-3	F316016000	Paper Feeding Motor Assembly
2-4	A279950001	Wire Band
3-1	F310011000	PE Lever Assembly A
3-2	F303007020	PE Sensor Lever Spring
3-3	F303009000	PE Board Assembly
3-4	F303009010	PE Board
3-5	A170202501	Reed Switch
3-6	F304059000	PTS Sensor Board Assembly C
3-7	F303030000	Home Position Sensor Board Assembly
3-8	F310009020	PE Lever Shaft
3-9	F303009021	PE Lead Wire
3-10	F303029020	PTS Sensor Lead Wire
4-1	F303014010	Timing Belt A
4-2	F303017000	Belt Driving Pulley Sub Assembly
4-3	B210151690	Miniature Ball Bearing
4-4	F303018010	Belt Driver Pulley
4-3	B210151690	Miniature Ball Bearing
4-5	F303018020	Belt Driven Pulley Flange
4-6	F316009000	Belt Tension Plate Assembly
5-1	F303004000	Platen A
5-2	F303006000	Carriage Sub Assembly
5-3	F303005010	Head Lock Lever
5-4	F303005020	Head Lock Lever Spring
5-5	F303001010	Carriage Shaft A

REF. NO.	PART NO.	DESCRIPTION
5-6	F303001020	Carriage Shaft B
5-7	F303001030	Head Adjust Lever
5-8	F316001010	Scale
5-9	F303001060	Scale Spring L
5-10	F303001070	Scale Spring R
5-11	F303001092	Ribbon Mask
5-12	F303001100	Head Sitting Plate
6-1	F303007011	Outer Paper Guide
6-2	F308002010	Inner Paper Guide
6-3	F303036010	Sprocket Frame L
6-4	F303037010	Sprocket Frame R
6-5	F303011020	Sprocket Wheel
6-6	F303036020	Paper Holding Cover L
6-7	F303037020	Paper Holding Cover R
6-8	F303011060	G-Pin
6-9	F303011040	Paper Holding Cover Spring
6-10	F303011050	Sprocket Lock Lever
6-11	F316003010	Sprocket Shaft
6-12	F303013020	Sprocket Gear
6-13	F304004020	Platen Plain Bearing
6-14	F303010010	Sprocket Guide Shaft
6-15	F303010020	Paper Guide Roller
6-16	F303001080	Sprocket Transmission Gear
6-17	F316010000	Paper Guide Plate D Assembly
7-1	F303020000	Planetary Lever Sub Assembly
7-2	F303020020	Planetary Pinion
7-3	F303014020	Ribbon Driving Gear
8-1	F316012000	Terminal Board Assembly

COMPUTERFACTS™ put easy to use, informative technical data right at your fingertips. Each edition includes specific service information on the individual component, along with some overall troubleshooting hints.

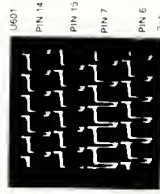
The following information is just a sample of the many valuable time saving features contained in this exclusive Sams COMPUTERFACTS publication:

- Preliminary Service Checks section is an easy to use, step by step guide for the experienced technician or hobbyist, and even beginners.
- SAMS famous industry accepted standardized notation schematics containing CIRCUITRACE®, GRIDTRACE™, waveforms, voltages and stage identification.



- Step by Step Troubleshooting guides the technician through the necessary procedures to quickly locate the problem.

TROUBLESHOOTING



MICROPROCESSOR CHIP (CPU) OPERATION

Verify the processor is functioning by checking the signals on the pins. The signals are: Q1, Q2, Q3, Q4, Q5, Q6, Q7, Q8, Q9, Q10, Q11, Q12, Q13, Q14, Q15, Q16, Q17, Q18, Q19, Q20, Q21, Q22, Q23, Q24, Q25, Q26, Q27, Q28, Q29, Q30, Q31, Q32, Q33, Q34, Q35, Q36, Q37, Q38, Q39, Q40, Q41, Q42, Q43, Q44, Q45, Q46, Q47, Q48, Q49, Q50, Q51, Q52, Q53, Q54, Q55, Q56, Q57, Q58, Q59, Q60, Q61, Q62, Q63, Q64, Q65, Q66, Q67, Q68, Q69, Q70, Q71, Q72, Q73, Q74, Q75, Q76, Q77, Q78, Q79, Q80, Q81, Q82, Q83, Q84, Q85, Q86, Q87, Q88, Q89, Q90, Q91, Q92, Q93, Q94, Q95, Q96, Q97, Q98, Q99, Q100, Q101, Q102, Q103, Q104, Q105, Q106, Q107, Q108, Q109, Q110, Q111, Q112, Q113, Q114, Q115, Q116, Q117, Q118, Q119, Q120, Q121, Q122, Q123, Q124, Q125, Q126, Q127, Q128, Q129, Q130, Q131, Q132, Q133, Q134, Q135, Q136, Q137, Q138, Q139, Q140, Q141, Q142, Q143, Q144, Q145, Q146, Q147, Q148, Q149, Q150, Q151, Q152, Q153, Q154, Q155, Q156, Q157, Q158, Q159, Q160, Q161, Q162, Q163, Q164, Q165, Q166, Q167, Q168, Q169, Q170, Q171, Q172, Q173, Q174, Q175, Q176, Q177, Q178, Q179, Q180, Q181, Q182, Q183, Q184, Q185, Q186, Q187, Q188, Q189, Q190, Q191, Q192, Q193, Q194, Q195, Q196, Q197, Q198, Q199, Q200, Q201, Q202, Q203, Q204, Q205, Q206, Q207, Q208, Q209, Q210, Q211, Q212, Q213, Q214, Q215, Q216, Q217, Q218, Q219, Q220, Q221, Q222, Q223, Q224, Q225, Q226, Q227, Q228, Q229, Q230, Q231, Q232, Q233, Q234, Q235, Q236, Q237, Q238, Q239, Q240, Q241, Q242, Q243, Q244, Q245, Q246, Q247, Q248, Q249, Q250, Q251, Q252, Q253, Q254, Q255, Q256, Q257, Q258, Q259, Q260, Q261, Q262, Q263, Q264, Q265, Q266, Q267, Q268, Q269, Q270, Q271, Q272, Q273, Q274, Q275, Q276, Q277, Q278, Q279, Q280, Q281, Q282, Q283, Q284, Q285, Q286, Q287, Q288, Q289, Q290, Q291, Q292, Q293, Q294, Q295, Q296, Q297, Q298, Q299, Q300, Q301, Q302, Q303, Q304, Q305, Q306, Q307, Q308, Q309, Q310, Q311, Q312, Q313, Q314, Q315, Q316, Q317, Q318, Q319, Q320, Q321, Q322, Q323, Q324, Q325, Q326, Q327, Q328, Q329, Q330, Q331, Q332, Q333, Q334, Q335, Q336, Q337, Q338, Q339, Q340, Q341, Q342, Q343, Q344, Q345, Q346, Q347, Q348, Q349, Q350, Q351, Q352, Q353, Q354, Q355, Q356, Q357, Q358, Q359, Q360, Q361, Q362, Q363, Q364, Q365, Q366, Q367, Q368, Q369, Q370, Q371, Q372, Q373, Q374, Q375, Q376, Q377, Q378, Q379, Q380, Q381, Q382, Q383, Q384, Q385, Q386, Q387, Q388, Q389, Q390, Q391, Q392, Q393, Q394, Q395, Q396, Q397, Q398, Q399, Q400, Q401, Q402, Q403, Q404, Q405, Q406, Q407, Q408, Q409, Q410, Q411, Q412, Q413, Q414, Q415, Q416, Q417, Q418, Q419, Q420, Q421, Q422, Q423, Q424, Q425, Q426, Q427, Q428, Q429, Q430, Q431, Q432, Q433, Q434, Q435, Q436, Q437, Q438, Q439, Q440, Q441, Q442, Q443, Q444, Q445, Q446, Q447, Q448, Q449, Q450, Q451, Q452, Q453, Q454, Q455, Q456, Q457, Q458, Q459, Q460, Q461, Q462, Q463, Q464, Q465, Q466, Q467, Q468, Q469, Q470, Q471, Q472, Q473, Q474, Q475, Q476, Q477, Q478, Q479, Q480, Q481, Q482, Q483, Q484, Q485, Q486, Q487, Q488, Q489, Q490, Q491, Q492, Q493, Q494, Q495, Q496, Q497, Q498, Q499, Q500, Q501, Q502, Q503, Q504, Q505, Q506, Q507, Q508, Q509, Q510, Q511, Q512, Q513, Q514, Q515, Q516, Q517, Q518, Q519, Q520, Q521, Q522, Q523, Q524, Q525, Q526, Q527, Q528, Q529, Q530, Q531, Q532, Q533, Q534, Q535, Q536, Q537, Q538, Q539, Q540, Q541, Q542, Q543, Q544, Q545, Q546, Q547, Q548, Q549, Q550, Q551, Q552, Q553, Q554, Q555, Q556, Q557, Q558, Q559, Q560, Q561, Q562, Q563, Q564, Q565, Q566, Q567, Q568, Q569, Q570, Q571, Q572, Q573, Q574, Q575, Q576, Q577, Q578, Q579, Q580, Q581, Q582, Q583, Q584, Q585, Q586, Q587, Q588, Q589, Q590, Q591, Q592, Q593, Q594, Q595, Q596, Q597, Q598, Q599, Q600, Q601, Q602, Q603, Q604, Q605, Q606, Q607, Q608, Q609, Q610, Q611, Q612, Q613, Q614, Q615, Q616, Q617, Q618, Q619, Q620, Q621, Q622, Q623, Q624, Q625, Q626, Q627, Q628, Q629, Q630, Q631, Q632, Q633, Q634, Q635, Q636, Q637, Q638, Q639, Q640, Q641, Q642, Q643, Q644, Q645, Q646, Q647, Q648, Q649, Q650, Q651, Q652, Q653, Q654, Q655, Q656, Q657, Q658, Q659, Q660, Q661, Q662, Q663, Q664, Q665, Q666, Q667, Q668, Q669, Q670, Q671, Q672, Q673, Q674, Q675, Q676, Q677, Q678, Q679, Q680, Q681, Q682, Q683, Q684, Q685, Q686, Q687, Q688, Q689, Q690, Q691, Q692, Q693, Q694, Q695, Q696, Q697, Q698, Q699, Q700, Q701, Q702, Q703, Q704, Q705, Q706, Q707, Q708, Q709, Q710, Q711, Q712, Q713, Q714, Q715, Q716, Q717, Q718, Q719, Q720, Q721, Q722, Q723, Q724, Q725, Q726, Q727, Q728, Q729, Q730, Q731, Q732, Q733, Q734, Q735, Q736, Q737, Q738, Q739, Q740, Q741, Q742, Q743, Q744, Q745, Q746, Q747, Q748, Q749, Q750, Q751, Q752, Q753, Q754, Q755, Q756, Q757, Q758, Q759, Q760, Q761, Q762, Q763, Q764, Q765, Q766, Q767, Q768, Q769, Q770, Q771, Q772, Q773, Q774, Q775, Q776, Q777, Q778, Q779, Q780, Q781, Q782, Q783, Q784, Q785, Q786, Q787, Q788, Q789, Q790, Q791, Q792, Q793, Q794, Q795, Q796, Q797, Q798, Q799, Q800, Q801, Q802, Q803, Q804, Q805, Q806, Q807, Q808, Q809, Q810, Q811, Q812, Q813, Q814, Q815, Q816, Q817, Q818, Q819, Q820, Q821, Q822, Q823, Q824, Q825, Q826, Q827, Q828, Q829, Q830, Q831, Q832, Q833, Q834, Q835, Q836, Q837, Q838, Q839, Q840, Q841, Q842, Q843, Q844, Q845, Q846, Q847, Q848, Q849, Q850, Q851, Q852, Q853, Q854, Q855, Q856, Q857, Q858, Q859, Q860, Q861, Q862, Q863, Q864, Q865, Q866, Q867, Q868, Q869, Q870, Q871, Q872, Q873, Q874, Q875, Q876, Q877, Q878, Q879, Q880, Q881, Q882, Q883, Q884, Q885, Q886, Q887, Q888, Q889, Q890, Q891, Q892, Q893, Q894, Q895, Q896, Q897, Q898, Q899, Q900, Q901, Q902, Q903, Q904, Q905, Q906, Q907, Q908, Q909, Q910, Q911, Q912, Q913, Q914, Q915, Q916, Q917, Q918, Q919, Q920, Q921, Q922, Q923, Q924, Q925, Q926, Q927, Q928, Q929, Q930, Q931, Q932, Q933, Q934, Q935, Q936, Q937, Q938, Q939, Q940, Q941, Q942, Q943, Q944, Q945, Q946, Q947, Q948, Q949, Q950, Q951, Q952, Q953, Q954, Q955, Q956, Q957, Q958, Q959, Q960, Q961, Q962, Q963, Q964, Q965, Q966, Q967, Q968, Q969, Q970, Q971, Q972, Q973, Q974, Q975, Q976, Q977, Q978, Q979, Q980, Q981, Q982, Q983, Q984, Q985, Q986, Q987, Q988, Q989, Q990, Q991, Q992, Q993, Q994, Q995, Q996, Q997, Q998, Q999, Q1000, Q1001, Q1002, Q1003, Q1004, Q1005, Q1006, Q1007, Q1008, Q1009, Q1010, Q1011, Q1012, Q1013, Q1014, Q1015, Q1016, Q1017, Q1018, Q1019, Q1020, Q1021, Q1022, Q1023, Q1024, Q1025, Q1026, Q1027, Q1028, Q1029, Q1030, Q1031, Q1032, Q1033, Q1034, Q1035, Q1036, Q1037, Q1038, Q1039, Q1040, Q1041, Q1042, Q1043, Q1044, Q1045, Q1046, Q1047, Q1048, Q1049, Q1050, Q1051, Q1052, Q1053, Q1054, Q1055, Q1056, Q1057, Q1058, Q1059, Q1060, Q1061, Q1062, Q1063, Q1064, Q1065, Q1066, Q1067, Q1068, Q1069, Q1070, Q1071, Q1072, Q1073, Q1074, Q1075, Q1076, Q1077, Q1078, Q1079, Q1080, Q1081, Q1082, Q1083, Q1084, Q1085, Q1086, Q1087, Q1088, Q1089, Q1090, Q1091, Q1092, Q1093, Q1094, Q1095, Q1096, Q1097, Q1098, Q1099, Q1100, Q1101, Q1102, Q1103, Q1104, Q1105, Q1106, Q1107, Q1108, Q1109, Q1110, Q1111, Q1112, Q1113, Q1114, Q1115, Q1116, Q1117, Q1118, Q1119, Q1120, Q1121, Q1122, Q1123, Q1124, Q1125, Q1126, Q1127, Q1128, Q1129, Q1130, Q1131, Q1132, Q1133, Q1134, Q1135, Q1136, Q1137, Q1138, Q1139, Q1140, Q1141, Q1142, Q1143, Q1144, Q1145, Q1146, Q1147, Q1148, Q1149, Q1150, Q1151, Q1152, Q1153, Q1154, Q1155, Q1156, Q1157, Q1158, Q1159, Q1160, Q1161, Q1162, Q1163, Q1164, Q1165, Q1166, Q1167, Q1168, Q1169, Q1170, Q1171, Q1172, Q1173, Q1174, Q1175, Q1176, Q1177, Q1178, Q1179, Q1180, Q1181, Q1182, Q1183, Q1184, Q1185, Q1186, Q1187, Q1188, Q1189, Q1190, Q1191, Q1192, Q1193, Q1194, Q1195, Q1196, Q1197, Q1198, Q1199, Q1200, Q1201, Q1202, Q1203, Q1204, Q1205, Q1206, Q1207, Q1208, Q1209, Q1210, Q1211, Q1212, Q1213, Q1214, Q1215, Q1216, Q1217, Q1218, Q1219, Q1220, Q1221, Q1222, Q1223, Q1224, Q1225, Q1226, Q1227, Q1228, Q1229, Q1230, Q1231, Q1232, Q1233, Q1234, Q1235, Q1236, Q1237, Q1238, Q1239, Q1240, Q1241, Q1242, Q1243, Q1244, Q1245, Q1246, Q1247, Q1248, Q1249, Q1250, Q1251, Q1252, Q1253, Q1254, Q1255, Q1256, Q1257, Q1258, Q1259, Q1260, Q1261, Q1262, Q1263, Q1264, Q1265, Q1266, Q1267, Q1268, Q1269, Q1270, Q1271, Q1272, Q1273, Q1274, Q1275, Q1276, Q1277, Q1278, Q1279, Q1280, Q1281, Q1282, Q1283, Q1284, Q1285, Q1286, Q1287, Q1288, Q1289, Q1290, Q1291, Q1292, Q1293, Q1294, Q1295, Q1296, Q1297, Q1298, Q1299, Q1300, Q1301, Q1302, Q1303, Q1304, Q1305, Q1306, Q1307, Q1308, Q1309, Q1310, Q1311, Q1312, Q1313, Q1314, Q1315, Q1316, Q1317, Q1318, Q1319, Q1320, Q1321, Q1322, Q1323, Q1324, Q1325, Q1326, Q1327, Q1328, Q1329, Q1330, Q1331, Q1332, Q1333, Q1334, Q1335, Q1336, Q1337, Q1338, Q1339, Q1340, Q1341, Q1342, Q1343, Q1344, Q1345, Q1346, Q1347, Q1348, Q1349, Q1350, Q1351, Q1352, Q1353, Q1354, Q1355, Q1356, Q1357, Q1358, Q1359, Q1360, Q1361, Q1362, Q1363, Q1364, Q1365, Q1366, Q1367, Q1368, Q1369, Q1370, Q1371, Q1372, Q1373, Q1374, Q1375, Q1376, Q1377, Q1378, Q1379, Q1380, Q1381, Q1382, Q1383, Q1384, Q1385, Q1386, Q1387, Q1388, Q1389, Q1390, Q1391, Q1392, Q1393, Q1394, Q1395, Q1396, Q1397, Q1398, Q1399, Q1400, Q1401, Q1402, Q1403, Q1404, Q1405, Q1406, Q1407, Q1408, Q1409, Q1410, Q1411, Q1412, Q1413, Q1414, Q1415, Q1416, Q1417, Q1418, Q1419, Q1420, Q1421, Q1422, Q1423, Q1424, Q1425, Q1426, Q1427, Q1428, Q1429, Q1430, Q1431, Q1432, Q1433, Q1434, Q1435, Q1436, Q1437, Q1438, Q1439, Q1440, Q1441, Q1442, Q1443, Q1444, Q1445, Q1446, Q1447, Q1448, Q1449, Q1450, Q1451, Q1452, Q1453, Q1454, Q1455, Q1456, Q1457, Q1458, Q1459, Q1460, Q1461, Q1462, Q1463, Q1464, Q1465, Q1466, Q1467, Q1468, Q1469, Q1470, Q1471, Q1472, Q1473, Q1474, Q1475, Q1476, Q1477, Q1478, Q1479, Q1480, Q1481, Q1482, Q1483, Q1484, Q1485, Q1486, Q1487, Q1488, Q1489, Q1490, Q1491, Q1492, Q1493, Q1494, Q1495, Q1496, Q1497, Q1498, Q1499, Q1500, Q1501, Q1502, Q1503, Q1504, Q1505, Q1506, Q1507, Q1508, Q1509, Q1510, Q1511, Q1512, Q1513, Q1514, Q1515, Q1516, Q1517, Q1518, Q1519, Q1520, Q1521, Q1522, Q1523, Q1524, Q1525, Q1526, Q1527, Q1528, Q1529, Q1530, Q1531, Q1532, Q1533, Q1534, Q1535, Q1536, Q1537, Q1538, Q1539, Q1540, Q1541, Q1542, Q1543, Q1544, Q1545, Q1546, Q1547, Q1548, Q1549, Q1550, Q1551, Q1552, Q1553, Q1554, Q1555, Q1556, Q1557, Q1558, Q1559, Q1560, Q1561, Q1562, Q1563, Q1564, Q1565, Q1566, Q1567, Q1568, Q1569, Q1570, Q1571, Q1572, Q1573, Q1574, Q1575, Q1576, Q1577, Q1578, Q1579, Q1580, Q1581, Q1582, Q1583, Q1584, Q1585, Q1586, Q1587, Q1588, Q1589, Q1590, Q1591, Q1592, Q1593, Q1594, Q1595, Q1596, Q1597, Q1598, Q1599, Q1600, Q1601, Q1602, Q1603, Q1604, Q1605, Q1606, Q1607, Q1608, Q1609, Q1610, Q1611, Q1612, Q1613, Q1614, Q1615, Q1616, Q1617, Q1618, Q1619, Q1620, Q1621, Q1622, Q1623, Q1624, Q1625, Q1626, Q1627, Q1628, Q1629, Q1630, Q1631, Q1632, Q1633, Q1634, Q1635, Q1636, Q1637, Q1638, Q1639, Q1640, Q1641, Q1642, Q1643, Q1644, Q1645, Q1646, Q1647, Q1648, Q1649, Q1650, Q1651, Q1652, Q1653, Q1654, Q1655, Q1656, Q1657, Q1658, Q1659, Q1660, Q1661, Q1662, Q1663, Q1664, Q1665, Q1666, Q1667, Q1668, Q1669, Q1670, Q1671, Q1672, Q1673, Q1674, Q1675, Q1676, Q1677, Q1678, Q1679, Q1680, Q1681, Q1682, Q1683, Q1684, Q1685, Q1686, Q1687, Q1688, Q1689, Q1690, Q1691, Q1692, Q1693, Q1694, Q1695, Q1696, Q1697, Q1698, Q1699, Q1700, Q1701, Q1702, Q1703, Q1704, Q1705, Q1706, Q1707, Q1708, Q1709, Q1710, Q1711, Q1712, Q1713, Q1714, Q1715, Q1716, Q1717, Q1718, Q1719, Q1720, Q1721, Q1722, Q1723, Q1724, Q1725, Q1726, Q1727, Q1728, Q1729, Q1730, Q1731, Q1732, Q1733, Q1734, Q1735, Q1736, Q1737, Q1738, Q1739, Q1740, Q1741, Q1742, Q1743, Q1744, Q1745, Q1746, Q1747, Q1748, Q1749, Q1750, Q1751, Q1752, Q1753, Q1754, Q1755, Q1756, Q1757, Q1758, Q1759, Q1760, Q1761, Q1762, Q1763, Q1764, Q1765, Q1766, Q1767, Q1768, Q1769, Q1770, Q1771, Q1772, Q1773, Q1774, Q1775, Q1776, Q1777, Q1778, Q1779, Q1780, Q1781, Q1782, Q1783, Q1784, Q1785, Q1786, Q1787, Q1788, Q1789, Q1790, Q1791, Q1792, Q1793, Q1794, Q1795, Q1796, Q1797, Q1798, Q1799, Q1800, Q1801, Q1802, Q1803, Q1804, Q1805, Q1806, Q1807, Q1808, Q1809, Q1810, Q1811, Q1812, Q1813, Q1814, Q1815, Q1816, Q1817, Q1818, Q1819, Q1820, Q1821, Q1822, Q1823, Q1824, Q1825, Q1826, Q1827, Q1828, Q1829, Q1830, Q1831, Q1832, Q1833, Q1834, Q1835, Q1836, Q1837, Q1838, Q1839, Q1840, Q1841, Q1842, Q1843, Q1844, Q1845, Q1846, Q1847, Q1848, Q1849, Q1850, Q1851, Q1852, Q1853, Q1854, Q1855, Q1856, Q1857, Q1858, Q1859, Q1860, Q1861, Q1862, Q1863, Q1864, Q1865, Q1866, Q1867, Q1868, Q1869, Q1870, Q1871, Q1872, Q1873, Q1874, Q1875, Q1876, Q1877, Q1878, Q1879, Q1880, Q1881, Q1882, Q1883, Q1884, Q1885, Q1886, Q1887, Q1888, Q1889, Q1890, Q1891, Q1892, Q1893, Q1894, Q1895, Q1896, Q1897, Q1898, Q1899, Q1900, Q1901, Q1902, Q1903, Q1904, Q1905, Q1906, Q1907, Q1908, Q1909, Q1910, Q1911, Q1912, Q1913, Q1914, Q1915, Q1916, Q1917, Q1918, Q1919, Q1920, Q1921, Q1922, Q1923, Q1924, Q1925, Q1926, Q1927, Q1928, Q1929, Q1930, Q1931, Q1932, Q1933, Q1934, Q1935, Q1936, Q1937, Q1938, Q1939, Q1940, Q1941, Q1942, Q1943, Q1944, Q1945, Q1946, Q1947, Q1948, Q1949, Q1950, Q1951, Q1952, Q1953, Q1954, Q1955, Q1956, Q1957, Q1958, Q1959, Q1960, Q1961, Q1962, Q1963, Q1964, Q1965, Q1966, Q1967, Q1968, Q1969, Q1970, Q1971, Q1972, Q1973, Q1974, Q1975, Q1976, Q1977, Q1978, Q1979, Q1980, Q1981, Q1982, Q1983, Q1984, Q1985, Q1986, Q1987, Q1988, Q1989, Q1990, Q1991, Q1992, Q1993, Q1994, Q1995, Q1996, Q1997, Q1998, Q1999, Q2000, Q2001, Q2002, Q2003, Q2004, Q2005, Q2006, Q2007, Q2008, Q2009, Q2010, Q2011, Q2012, Q2013, Q2014, Q2015, Q2016, Q2017, Q2018, Q2019, Q2020, Q2021, Q2022, Q2023, Q2024, Q2025, Q2026, Q2027, Q2028, Q2029, Q2030, Q2031, Q2032, Q2033, Q2034, Q2035, Q2036, Q2037, Q2038, Q2039, Q2040, Q2041, Q2042, Q2043, Q2044, Q2045, Q2046, Q2047, Q2048, Q2049, Q2050, Q2051, Q2052, Q2053, Q2054, Q2055, Q2056, Q2057, Q2058, Q2059, Q2060, Q2061, Q2062, Q2063, Q2064, Q2065, Q2066, Q2067, Q2068, Q2069, Q2070, Q2071, Q2072, Q2073, Q2074, Q2075, Q2076, Q2077, Q2078, Q2079, Q2080, Q2081, Q2082, Q2083, Q2084, Q2085, Q2086, Q2087, Q2088, Q2089, Q2090, Q2091, Q2092, Q2093, Q2094, Q2095, Q2096, Q2097, Q2098, Q2099, Q2100, Q2101, Q2102, Q2103, Q2104, Q2105, Q2106, Q2107, Q2108, Q2109, Q2110, Q2111, Q2112, Q2113, Q2114, Q21